SECOND SUPPLEMENTAL APPROPRIATION BILL, 1957

UNIVERSITY
OF MICHIGAN

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HEARINGS

BEFORE

SUBCOMMITTEES OF THE COMMITTEE ON APPROPRIATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

PART 2

INVESTIGATION OF ATOMIC ELECTRIC POWER

Printed for the use of the Committee on Appropriations

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INVESTIGATION OF ATOMIC ELECTRIC POWER

WITNESSES

ATOMIC ENERGY COMMISSION

LEWIS L. STRAUSS, CHAIRMAN
THOMAS E. MURRAY, COMMISSIONER
WILLARD F. LIBBY, COMMISSIONER
HAROLD S. VANCE, COMMISSIONER
K. E. FIELDS, GENERAL MANAGER
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DON S. BURROWS, CONTROLLER
W. K. DAVIS, DIRECTOR, DIVISION OF REACTOR DEVELOPMENT
REAR ADM. H. G. RICKOVER, CHIEF, NAVAL REACTORS BRANCH, DIVISION OF REACTOR DEVELOPMENT
HAROLD L. PRICE, DIRECTOR, DIVISION OF CIVILIAN APPLICATION
F. J. McCARTHY, JR., ASSISTANT CONTROLLER FOR BUDGETS
J. A. MILLER, DEPUTY ASSISTANT CONTROLLER FOR BUDGETS

MONDAY, JUNE 25, 1956.

COMMITTEE PROCEDURE

Chairman CANNON. The committee will be in order.

May I say by way of preface that this phase of the hearing is devoted to the reactor development program. The justifications in the budget estimates are in most part unclassified.

It is the purpose of the committee to declassify this particular record to the maximum extent compatible with public interest.

In our study of the subject matter there seems to be little, if any, justification for classification of any information to be adduced in this hearing.

If the transcript is not encumbered with classified material, the processing of the transcript and the printing and distribution of the hearings will be facilitated.

In order to accommodate the possibility that classified information may be mentioned, any such mention will by request be off the record.

If it should appear desirable that classified information be properly included in the answer to any question, it is requested that the AEC make appropriate notations at the time, then at the conclusion of the unclassified portion of the hearing the committee will be glad to go back to such points on which the Commission may desire to furnish classified information in response to any question previously asked.

IMPORTANCE OF PUBLIC UNDERSTANDING OF ATOMIC ENERGY

At the expense of repetition, may I say again that the committee feels that this record should be available to the public in the fullest extent.

Atomic energy is one of the miracles of the century, a century in which the advancement of science has transcended the imagination of mankind.

Atomic energy has incredible potentials for the betterment of mankind. And it has appalling destructive powers which we hope it will never again be necessary to use for purpose of devastation.

The potential of atomic energy as a blessing to mankind cannot be overstated or overemphasized.

Its earliest possible application to the peaceful purposes of humanity is the vital and immediate problem before us.

It is the duty of every American man and woman to become well informed on the subject.

It is the duty of the Government to give the American public maximum aid in understanding what atomic energy is, what it now means, and what it can accomplish in the future.

The cloak of mystery should be eliminated to the point where the average nontechnical individual will become cognizant of its significance.

SHORTAGE OF SCIENTISTS AND NEED FOR ENCOURAGING SCIENTIFIC EDUCATION

The problem of educating our children to become scientists, engineers, and technicians, is one of the accompanying problems facing this country today.

We are informed that the shortage of manpower in this field is critical, almost to the point of being desperate.

We are told that Russia is graduating each year more scientists than we are training.

Finally, favorable opportunities should be provided for college students to enter these critical professions and at the same time our voca-

tional and postgraduate schools should be encouraged to offer attractive advanced courses in these fields.

Atomic energy is the vested property of every citizen of the United States. They have both bought it and paid for it. They have spent $15 billion in 13 years to develop atomic energy to its present state.

This technology is a basic resource of the Nation as a whole just as much as are our harbors, rivers, farmlands, and mineral deposits. It must be made available on a basis of absolute equality. Discrimination in favor of or against any phases of our economy must not be permitted.

Reactor Development Program

ESTIMATES, 1957 AND APPROPRIATION, 1956

Taking up in detail the reactor development program we find the Commission's budget estimate for fiscal year 1957 is $285,335,000, an increase of $113,208,000 over the budget estimate for the fiscal year 1956.

CIVILIAN POWER REACTOR PROGRAM

The first item in the program is the "Civilian power reactor program."

In fiscal year 1955, $27,261,202 was actually expended.

The budget estimate for fiscal year 1957 is $53,156,000, or $13,762,000 more than the budget estimate for fiscal year 1956, which was $39,394,000.

DEVELOPMENT OF FIVE BASIC REACTOR CONCEPTS

It is to be noted that the Commission in the budget estimates now before us states that this program has been centered around the development of five basic reactor concepts. The designations of these five different reactor concepts are as follows: (1) Pressurized water reactor; (2) boiling water reactor; (3) homogeneous reactor, also referred to as aqueous homogeneous reactor; (4) breeder reactor, also referred to as fast breeder reactor; and (5) sodium graphite reactor, also referred to as sodium reactor.

We note that the development of these five basic concepts has reached the point experimentally that the construction of reactor powerplants embodying each of the five reactors is technically feasible.

We also note that the Commission in the budget estimate includes 3 more basic concepts of reactors beyond these 5. These will be named and given numbers, 6, 7, and 8, in order to distinguish them from the original 5 basic concepts, as follows: (6) Liquid metal fuel reactor; (7) organic moderator reactor; and (8) water graphite reactor.

It is our understanding that the technology on these three additional basic concepts of reactors has not progressed to the point where it can be said that the construction of atomic plants embodying each of them is technically feasible.

The committee, of course, is interested in hearing a presentation of each of these basic concepts, but desires for the purpose of simplicity a more complete presentation on the original five basic types.

GENESIS OF FISSION REACTION

At this time I would like to ask the Chairman to tell us something about the genesis of fission reaction.

Mr. STRAUSS. Mr. Chairman, may I first compliment you on the statement with which you have opened this hearing, and to say that your suggestion that it be unclassified, barring exceptions where we might be disposed for the better enlightment of the committee to deal with classified matters, which we will then identify, is entirely agreeable to us.

As a matter of fact, in the document which we have presented to you, you will find that the pages dealing with this entire program are marked unclassified and only those are marked confidential, or secret, which deal with reactors for the military program and they are only a few.

Chairman CANNON. We will first take up the unclassified material and at the close of that discussion any matter of a classified nature you think is pertinent.

Mr. STRAUSS. Now, Mr. Chairman, I would be delighted to answer your first question myself, but in view of the fact that we have a distinguished scientist as a member of this Commission, I feel it might be agregarious for me to do so, if you will accept an answer from him on the point which you have made.

I am satisfied that Dr. Libby can present it in more accurate and more understandable terms than I.

Chairman CANNON. You know, Admiral Strauss, all of us have to be educated. I think the people of the country as a whole should be educated along with the committee.

We shall be glad to hear from Dr. Libby.

Dr. LIBBY. Thank you, Mr. Chairman.

Nuclear fission was discovered in December 1938 quite accidentally, as so often happens with the most important discoveries, by a German professor, Otto Hahn.

Chairman CANNON. It was discovered as a result of research supported by Federal appropriations?

Dr. LIBBY. I am uncertain.

Mr. STRAUSS. The institute in which he worked was supported by the German Government.

Dr. LIBBY. He is now director of the Max Planck Institute and this is a German Federal research organization. I think he was employed in that institute in Berlin at the time he made this discovery.

They have a chain of research institutes in Germany which are somewhat similar to our national laboratories, though they are devoted more to pure research than to a mixture of pure and applied, as ours are.

But that was the beginning of atomic energy in the sense in which we use the word.

Prof. Enrico Fermi had been studying the irradiation of uranium with neutrons and had discovered the strange behavior of uranium in the presence of neutrons. It was the elucidation of this phenomenon which led Professor Hahn to the discovery of its fission reaction.

Now, note that Professor Fermi was the first man to ever irradiate uranium with neutrons purposely. He made observations of the

strange behavior. What he was getting, of course, is what we now call the fission products that we are so worried about and think about so much.

As soon as Professor Hahn had discovered the extraordinary nature of the effect of neutrons on uranium atoms, namely, to split them into two roughly equal parts which fly apart at high velocity, Professor Fermi immediately realized the practical significance of this fact and went to work on it.

Now, it was an extraordinary accident that this man, one of the greatest scientists who has ever lived, was interested in this problem. It was an extraordinary accident, almost providential in character, that he should have had the equipment, theoretical as well as experimental. He was gifted as a theoretician, beyond most theoreticians.

In addition, he was an excellent experimentalist. The combination of understanding of the theoretical and of the practical aspects, that rare combination in a man of this ability, is the thing that led to the development of the chain reacting pile in December 1942.

It could well have been a whole generation later.

In fact, I think the odds are that it would have been had it not been for Enrico Fermi.

Remember that in Germany at the same time a most distinguished group was attempting the same thing. They made 2 mistakes, 2 very fundamental mistakes, which would have kept them from the discovery. Though they came quite close, they never did actually achieve a chain reacting pile.

Now, the achievement was twofold. Fermi understood that the neutrons from the fission reaction had to multiply themselves, so it was necessary that as an atom splits it give off neutrons as well as the two particles that fly apart.

Since the initial split was excited by the neutron, he saw that these neutrons which came out at the same time the split occurs might be encouraged to excite another fission, to produce the chain reaction. That is the trick.

To get at least one of the 2.5 neutrons which come out in a fission act to go back and cause another fission.

If you can do that, you are in business. That is the job.

Well, the first thing is to preserve these neutrons——

Chairman CANNON. In the breeder formula you hope to come out with more power than you put in?

Dr. LIBBY. That is the hope, sir. That is the dream, the aim.

The breeder differs from the thermal reactor in that these neutrons are taken fresh in the breeder and put right back into another atom. That is the way atomic bombs work; the fast breeder is like a bomb in the sense that it uses the neutrons immediately after they are born.

Now, in the ordinary pile you let the neutrons travel around and come down to a lower velocity. That is the purpose of the moderator.

Neutrons wander long distances. That is why the piles have to be so enormous. Fermi's first job was to make sufficient material of exceptional purity so that the neutrons would not be absorbed by impurities, which eat them up with great avidity.

He had to prepare many, many tons of graphite that was of unbelievable purity.

Now, this is a practical job. He kept at it until he had a sufficient tonnage of pure graphite so that he could try his experiment. This kind of work requires a man with more than just theoretical training. He had to be enough of an engineer to be able to get the large tonnages of extremely pure graphite and to realize that it was essential.

He did the job. He also got the uranium. Uranium metal had not been produced in any significant amount up to that time. This again was a job of securing special materials. It is these things that the Germans were unable to do, but Fermi was successful.

Now, the whole matter of the chain-reacting pile was settled in principle by Fermi's successful experiment in December 1942. I say in principle because he showed that you could produce a chain reaction.

On July 16, 1945, what you might call the fast reaction was first demonstrated; namely, in the atomic bomb at Alamogordo; but Fermi's first demonstration that you could make the chain reaction go and turn loose the energy of the atom was 90 percent of the story.

What we are discussing here today, I think in principle, gentlemen, is the 10 percent that is left to be done.

Of course, this will take time and this will take money, but never forget that we will get there the quicker and the cheaper if we can only find another Enrico Fermi to do that last 10 percent for us.

But we will have to plug along as best we can with the people we have, and the ability we have, and they are good.

It is not criticism of anyone to say that he is not an Enrico Fermi. They are good, but it costs us money and time because we are not able to move with the sureness and dispatch and certainty that this man had. He never missed.

Chairman CANNON. Professor Fermi brought the result of his work directly to the American people?

Dr. LIBBY. Yes, sir. His life is told in a book by Mrs. Fermi; I think the title is "Atoms in the Family." I recommend it to you, members of this distinguished committee, as a fine piece of writing, as well as the biography of a very great man. It tells how he came to this country and why. The totalitarian government of Fascist Italy drove him out. They did not force him out; in fact, they were most sorry he left. He was quite their most distinguished scientist, but their methods led him to leave and this was, of course, our good fortune.

We had about a half-dozen such people, or perhaps a dozen, who contributed immeasureably to the success of the whole atomic energy project.

I think you gentlemen know Prof. Edward Teller, and I could name several others.

GENERATION OF ATOMIC ENERGY FOR CIVILIAN POWER

Chairman CANNON. Will you tell us briefly, Admiral Strauss, something of the generation of atomic energy for civilian power, and describe for us the first, second, and third attempts and the fourth or current endeavor which we know as the 5-year program begun prior to the enactment of the 1954 Atomic Energy Act?

Mr. STRAUSS. Mr. Chairman, the Commission had in mind the development of power of atomic energy from the very date of its

conception. We were told as early as December 1946 that it would be possible to light a few electric lamps with power from one of the piles, with heat from one of the piles, if we were interested in doing it as a stunt.

The Commission decided as long ago as that that it was not concerned with a demonstration purely for purposes of effect, but of no practical significance.

But the laboratories which existed at Oak Ridge and the Argonne Laboratory which the Commission established near Chicago, and its subsidiary laboratory at Arco, Idaho, had two primary purposes: the development of military and civilian reactors. Great emphasis was given to the latter, although obviously the primary emphasis was given to military reactors in view of the precept laid down in the first article, I believe it is, of both the 1946 and 1954 acts, which charges the Commission with the maximum contribution to the common defense and security as its primary objective.

The art had not reached the point of the development of a civilian power reactor prior to the spring of 1954. At that time, however, military reactors, specifically those of the pressurized water variety, had been demonstrated to be feasible and successful.

DEVELOPMENT AND USE OF PRESSURIZED WATER REACTOR

The Commission had built at its Arco, Idaho, Laboratory a prototype of the pressurized water reactor, the type which later was installed in the submarine *Nautilus*. As you gentlemen know, this reactor has operated with great success in the *Nautilus*. In the spring of 1954, a proposal was received from the Duquesne Light Co., of Pittsburgh, to construct, with the assistance of the Westinghouse Electric Corp., a generator at a site near Pittsburgh, at Shippingport, Pa. The proposal was to couple the generator with an atomic reactor of the pressurized water variety to be built by the Commission.

There were some refinements to that proposal. That is to say, the private interests contributed $5 million toward the cost of the Government's part of the reactor; they contributed the site; and they also agreed to contribute the personnel costs for operating the reactor.

Chairman CANNON. Why was the pressurized water system chosen in preference to one of the other four systems?

Mr. STRAUSS. It was the most fully advanced. It was the system which had had the most complete demonstration of both feasibility and safety at that time.

Chairman CANNON. Do you still believe it offers the best prospects of economic development of competitive power?

Mr. STRAUSS. No, I would not say I consider that to be the fact. But I believe that while other proposals have a better immediate future, the fact that the pressurized water reactor will come into operation first will certainly mean that a great deal of information will be gained both from its construction and operation. This information will in turn lead to more economic construction and operation of successive plants of that description.

If that is the case, this will be the sort of contest in which perhaps periodically one type or another will for a temporary period of time assume the lead over other projects.

But at the time when this was undertaken by the Duquesne Light Co., it was the one proposal which offered less operating hazard both to the operators and to the community. It also provided more certainty of the development of the amount of power expected.

Chairman CANNON. Also economic development?

Mr. STRAUSS. No. Even at the time it was begun, the interests which went into it did so with their eyes open, aware of the fact that it would not be an economic unit.

They did so with the expectation that its subsequent operation might develop substantial economies.

In the course of its design new types of fuel elements were developed to give longer life and thus require less frequent changing and reprocessing.

BACKGROUND TO BUILDING SHIPPINGPORT PLANT WITH PRESSURIZED WATER REACTOR

Chairman CANNON. Did Commissioner Murray recommend that the Shippingport plant be built with the pressurized water reactor which was available because the aircraft carrier reactor project was terminated?

Mr. STRAUSS. Not to my knowledge, sir.

Chairman CANNON. Was any member of the Commission particularly instrumental in that respect?

Mr. STRAUSS. Not to my knowledge. It is well known that the Commission was interested in obtaining assistance from private industry. The first communication between the Commission and the Duquesne Light Co. was with me, but I have never claimed any credit for having initiated it because I did not.

I think it was initiated by the president of the Duquesne Light Co., a man by the name of Flagler, whom I met for the first time in that connection. I had never known him before, and my only subsequent contacts with him have been in connection with that operation.

Chairman CANNON. Commissioner Murray, your name is associated in my mind with this particular development, and especially as recommending this method, the pressurized-water method. I do not know just how I got the impression, but what was your association, if any, with the selection of this particular method?

Mr. THOMAS E. MURRAY. Well, for what it is worth, I will give you a little background on the situation.

There was a pressurized water reactor which was supposed to be in the naval program. It was known as the CVR reactor, a pressurized type of reactor.

For some reason or other the Navy decided they would not go ahead with that project. The project was pretty well engineered and thought out by the Naval Reactors Branch in the Commission.

Immediately, I suppose within days, after the news came to me that this CVR, the pressurized-water reactor, was not to go ahead as part of the Navy program, I took steps to advocate that the Commission should take over that particular job and build that particular reactor.

Chairman CANNON. Rather than the Navy?

Mr. THOMAS E. MURRAY. Rather than the Navy.

As a result of that decision, I made recommendations to the Commission—I can't give you the exact dates, but it was early 1953—that

this project should be included as part of our particular program.

My original thought was that that reactor, which was at that time designed to produce some 60,000 kilowatts, should be placed at one of our production plants.

However, as you know and as the chairman has told you, that particular program was changed and the Duquesne Light Co. and one or two others, showed an interest in taking over such a project in connection with the development of power in their particular area.

So, instead of placing the project at one of our production sites, we went along with the Duquesne proposal that they take the steam to be generated from this particular reactor and generate electricity.

The question of bringing in the Duquesne Co. was many, many months after the idea was finally approved and adopted by the Commission that this reactor should be built.

The Navy was not going to be building it; the AEC should build it.

We felt at that time this project would give us a large-scale power reactor of this particular design which, as the Chairman has explained to you, was the one that was nearest to completion.

Now, as to the question of who takes the credit for starting the PWR project, you can get all sorts of opinions, as you have here this morning, that I was not instrumental in bringing this to fruition.

But I recall very vividly asking Admiral Rickover and Commander Roddis, I think within 24 hours after the project was canceled in the Navy program, to come to my office and to explore the possibilities of putting this into civilian use.

I also recall going before the National Security Council in 1953 and advocating personally to the National Security Council that this reactor should be built.

There was great opposition to the building of this reactor from an economic standpoint. The arguments were to the effect that if you waited a year or 2 or 3 years, you would have a much more economical reactor.

But it was finally decided that it was a good idea to get one of these big reactors built and in building the reactor, to get as much new knowledge on the question of the size of reactor possible under the circumstances.

I do not know why this particular question is raised, as to who is responsible one way or the other.

Chairman CANNON. I do not know that it is so important, Commissioner, but I do recall now, on reflection, that my information was that at your instance the matter was handled by the Commission itself rather than by the Navy and that later on the Duquesne people were brought in.

Mr. THOMAS E. MURRAY. That is right.

Mr. STRAUSS. Mr. Chairman, I can supply some dates and facts.

Chairman CANNON. Yes; we will be glad to have that, Admiral Strauss.

Mr. STRAUSS. This project was canceled by the Navy to the extent that it had ever been determined by the Navy, in late March or early April 1953; I was not then a member of the Commission.

The first pressurized water prototype reactor did not operate until the summer of 1953 at Arco.

This particular project did not get on the rails until the spring of 1954 when the Duquesne Co. came in.

Now, I do not think that anybody on the Commission has asserted, or should assert, any particular credit for this project with the exception of the staff who have plugged this thing from the kickoff, and who are the mainsprings in this business.

If any credit is to be apportioned, that is the place it is to go.

Chairman CANNON. As I have said, I think the question of credit is inconsequential.

Now, will you describe the first, second and third attempts and the fourth or current endeavor which you know as the 5-year program, which commenced prior to the enactment of the 1954 Atomic Energy Act?

Mr. STRAUSS. After the pressurized water reactor was begun by the Duquesne Co., which was a project instituted under the terms of the 1946 act, we had before us the congressional debate on the legislation which resulted in the 1954 act. Immediately thereafter the Commission initiated its power demonstration program, and this program resulted in the first group of projects which is before you. That program was followed in September of last year—I believe I have the date correctly—by a second round designed to encourage the companies or cooperatives which might be interested in rather smaller units, and therefore, perhaps, less economic units. The closing date, I believe, was set for January 1 of this year. Am I correct, General Fields?

Mr. FIELDS. February 1.

Mr. STRAUSS. February 1, and I think there was an extension.

In any event, those are the three steps which had been taken in connection with the program unless one includes as a separate step the fact that some companies have approached the Commission for licenses and permits completely independent of the demonstration program and to be financed by industry in toto without Government assistance or subventions of any sort.

Those have all been detailed for the record with the statement with which you permitted me to open this hearing and which I am not repeating in the interest of conserving your time.

DIFFICULTY OF OBTAINING ELECTRIC ENERGY FROM FISSION

Chairman CANNON. Now, will you give us in this connection a description of fission in terms understandable to the ordinarily well informed person and in that connection will you include a description of how heat is a part of the energy released in fission and will you also include a statement as to how we can get electricity out of fission?

Can it be done without going through a steam cycle as in the case of a conventional powerplant?

Mr. STRAUSS. Starting with the last part of your question, at the present time, Mr. Chairman, we know of no method of obtaining energy for useful purposes from a reactor without the heat cycle.

Chairman CANNON. What about the steam cycle?

Mr. STRAUSS. The steam cycle is what I have reference to. That is to say, the pile is cooled either by water or liquid metal or by some other circulating medium, and the coolant is run through a boiler, steam is produced in the boiler, and from that point on what occurs is the orthodox procedure, namely, that steam is used to turn a wheel, be it a turbine or what.

Now, there are a number of people who are at work in an attempt to convert the energy that exists in an atomic reactor into electrical energy directly without the interposition of the heat, or steam cycle.

This can be done on a small scale today extremely inefficiently by the use of thermocouples, a thermocouple being a device which employs the fact that under certain conditions a current is generated in metals of a specific——

Chairman CANNON. You say the methods used today are inefficient?

Mr. STRAUSS. The methods used today to produce electrical energy from a pile other than by the heat cycle are inefficient.

Chairman CANNON. That is being remedied?

Mr. STRAUSS. That may be remedied. It is my hope that it will be remedied.

But the fact remains that, since heat will always be a concomitant phenomenon with the operation of a pile, it seems inevitable that heat will have to be removed from the pile in order to cool it, to keep it from melting down.

If the heat is removed it should be used. Therefore, the production of some energy as a result of the heat cycle will always be necessary in order to produce the maximum efficiency from a pile.

I think that some form of heat engine will always be associated with an atomic reactor for that reason, unless at some future date someone discovers a means of running them cold. I do not believe that that idea has ever been advocated, or that anyone has ever had a glimmer of an idea as to how it might be accomplished.

DESCRIPTION OF A REACTOR

Chairman CANNON. Could we say, Admiral Strauss, that a reactor is simply a substitute furnace, in other words, an atomic furnace which turns the heat available from fission fuel into heat to be used more or less as in a conventional powerplant cycle to generate electricity?

Mr. STRAUSS. That analogy has been used so often I think it is well to allow it to stand. It is a furnace, but not in the sense that there are flames and smoke—there is even an analogy for flame and smoke.

Chairman CANNON. Will you give us a working understanding of the term "reactor."

Mr. STRAUSS. A reactor is a furnace in which uranium or plutonium in our own enterprise is the fuel. That is to say, it takes the place of the coal or oil. An amount of uranium of the critical mass or in excess of the critical mass is used.

A fission reaction occurs and is sustained because the mass is critical.

Chairman CANNON. You could use any other agent beside uranium?

Mr. STRAUSS. Uranium or isotopes of uranium or plutonium are the only elements which so far as I know will sustain a chain reaction and produce a continuing flow of neutrons and heat.

Chairman CANNON. There is no practical prospect that we will ever add to those two reagents?

Mr. STRAUSS. I do not feel competent to venture such a prediction, Mr. Chairman. There are those who say that there will never be others. They probably do not exist in nature any more than plutonium did prior to World War II.

But it would be, I think folly, to predict that none will ever be found or be produced, as a result of some other process, which might be naturally fissionable.

Dr. Libby, would you support this?

Dr. LIBBY. I would suggest, Mr. Cannon, that the chances of getting atomic fuels other than uranium and plutonium are extremely small.

However, there are already other elements known which will support fission. They are transuranic elements above plutonium.

Dr. Seaborg at Berkeley has discovered several of them, but they are in such tiny amounts that they would not make a good pinhead. Therefore, they are of no practical significance for atomic fuels.

I think the chairman's statement is exactly right: that, as far as we know, reactor fuel is limited to uranium isotopes and plutonium isotopes. Just uranium and plutonium, that is all we have and all we are likely to have within our lifetime for atomic furnaces.

Chairman CANNON. There is ample supply of uranium and plutonium for our immediate needs?

Dr. LIBBY. Yes, sir.

Chairman CANNON. How about our ultimate needs?

Dr. LIBBY. I think it will be ample.

Mr. STRAUSS. By reason of the fact, Mr. Chairman, that a fissionable material can be produced from a far more abundant element, thorium, in a reactor and by reason of the fact that supplies of uranium are being found in many places where they were not believed to exist.

Chairman CANNON. Now that you have told us what a reactor is, Doctor, can you compare the size of the reactor core with the usual boiler combustion space for a large generator, say a hundred thousand kilowatts?

Mr. STRAUSS. There are here, Mr. Chairman, engineers who are familiar with both types of installations and more precise answer to that question might be supplied by Mr. Davis.

Mr. DAVIS. The actual volume of a reactor where the heat is produced is a very small fraction of the equivalent volume of a combustion space in a modern boiler.

I don't have any exact figures, but it is certainly of the order of 1 percent, or something of this sort. It is at least 100 times more compact.

Chairman CANNON. Mr. Davis, what is the size of that pressurized water reactor—the size of the core?

Mr. DAVIS. The size of the core is about 6½ feet in diameter by 6½ feet high. It is a cylinder roughly 6½ feet in diameter.

Chairman CANNON. The usual boiler combustion space for a 600,000-watt generator would be that size, or more or less?

Mr. DAVIS. Boilers for a powerplant of that size would probably be something like 12 or 13 stories high.

Mr. STRAUSS. It should be said, Mr. Chairman, in fairness to both systems, that the size of the reactor core in itself by comparison with the boiler, is a little misleading. The reactor core has to be surrounded with shielding. That shielding, at least in the present state of our technology, is an integral part of aiy such installation.

It could not be installed just naked.

Chairman CANNON. That shielding would be of lead or concrete?

Mr. STRAUSS. That shielding could be of any variety of materials, lead, concrete, or earth. But to separate the reactor core from the shielding to make a comparison, I think we would be unintentionally misleading you and that we don't want to do.

RELATIVE SUPPLY OF URANIUM AND FOSSIL FUELS

Chairman CANNON. Now, let us take up the relative supply of uranium and the fossil fuels. We understand that the amount of uranium and thorium occurring in natural granite is about 20 to 30 parts per million.

As has been said, it is merely a pinpoint. But we are told that even this infinitesimal quantity is sufficient to make each pound of granite equivalent to 54 pounds of coal.

Would you say that is an accurate figure?

Mr. STRAUSS. The figure I have heard is about two parts per million in granite.

Dr. LIBBY. Mr. Davis says it is 20.

Mr. DAVIS. It is 20 of uranium and thorium, and two-thirds is thorium.

Chairman CANNON. Would you say, then, a pound of granite in that respect is equivalent to 54 pounds of coal?

Mr. DAVIS. I have made such a calculation and came out with that number; yes, sir.

Chairman CANNON. And could you say a complete fissioning of the thorium and uranium in 1 pound of granite may release about 60 times as much heat as the burning of a pound of coal?

Mr. STRAUSS. There is a catch-phrase in that, Mr. Chairman. That is the phrase "complete fission." We have never achieved a complete fissioning of uranium.

We approach it more gradually every day; otherwise, I suspect that that calculation is also from Mr. Davis' work.

Mr. DAVIS. Yes, this is what you might be able to achieve, sir, by use of a breeder where you would gradually convert all of the thorium and uranium to fissionable materials, and burn them in turn.

If one could recover all of the material from the granite, could in turn run it through a breeder and convert it all to fissionable material, the calculation would be something like 50 times on a pound-per-pound basis.

Chairman CANNON. We are also told that the known relatively high-grade sources of uranium represent a larger potential source of fuel energy than all the coal reserves in the United States.

I read just recently a magazine article to the effect that whereas up to this time we had generally considered our supply of coal as for the time being inexhaustible, as a matter of fact, we can already see the end of adequate coal supplies.

What about the relative energy of the uranium available, and the coal available at this time?

Mr. STRAUSS. I cannot give you any figures on it, sir, with which I would be willing to agree for the following reasons: The supply of uranium is being increased by exploration and prospecting almost daily. It has far exceeded anything that the Commission had any reason to anticipate in the United States a few years ago.

The reserves of coal in the United States are reputed to be an amount sufficient at current rates of consumption to last for 200 or 300 years.

Now, whether that figure is correct, or not, I do not know. I suspect that as time goes on coal will become more and more expensive to produce.

That is to say, the seams will be deeper, the labor will be more expensive, and we will be working in coal of lower grade, that is, coal of fewer B. t. u.'s per ton.

Chairman CANNON. I interrupted you, Mr. Davis, just now. I will ask you to continue your statement on the relative potential source of energy as between our visible supply of uranium and plutonium and our visible supply of coal at this time.

Mr. DAVIS. I am sorry, Mr. Chairman, that I do not have all of those figures with me, but I could speak on the basis of recollection and perhaps furnish corrections later. It is my recollection that the people who have studied this question have used a unit which they call a Q unit, which is 10 to the 18th, or 10 followed by 18 zeros of B. t. u's.

They estimate that the economically recoverable coal resources in the United States in these terms is something like six of these units.

On the same basis they have estimated that the recoverable uranium—this is not going to the extent of mining granite, but the recoverable resources of low grade but still fairly rich sources of uranium—is of the order of 600 of these units, or 100 times as great.

If one includes the coal resources outside the United States, this ratio is then of the order of something like 25 times as great.

The people who have studied this matter are of the opinion there is 25 times as much economically recoverable uranium as there is coal. These are more-or-less known reserves and do not include additional discoveries.

Chairman CANNON. I have just been handed a transcript of your remarks prepared by you on June 13, in which you say:

> The known relatively high grade sources of uranium represent a larger potential source of fuel energy than all the coal reserves in the United States.

Mr. DAVIS. Yes, sir.

Chairman CANNON. That is a little different from my first question. I asked about the world supply of coal. What about the supply of coal here in the United States?

Mr. DAVIS. The supply of coal in the United States is roughly 6 of these energy units and the total reserves of uranium are estimated at something like 100 times as much.

Chairman CANNON. That is decisive.

DESCRIPTION OF FIVE BASIC TYPES OF REACTORS

I referred earlier to the 5 basic types of reactors and the 3 additional concepts of reactors. It is our understanding that with respect to the 5 basic types the Commission has constructed experimental reactors of a type which you intend to be primarily, or nearly exact, prototypes of full-scale reactors, but on a smaller scale, and that these experimental reactors can be extrapolated into full-size commercial units.

Will you give us a statement on that?

Mr. STRAUSS. Is that directed to Mr. Davis, or to me?

Chairman CANNON. I direct it to you and you can pass it along, if you wish.

Mr. STRAUSS. It is to the best of our knowledge, and belief, true, sir.

Chairman CANNON. We will turn now from general information to a comparison of the 5 basic reactors and the 3 additional reactors, making 8 in all. There seems to be no certainty that the number of reactors will be limited even to these 8.

Mr. STRAUSS. That is right, Mr. Chairman.

Chairman CANNON. But for the time being we are dealing here with what we have before us, and we have before us the 5 basic and 3 additional reactors, 8 in all. The committee has been exposed to terms such as fission, reactors, nuclear powerplants, atomic furnaces, and so forth.

At this point we are interested in receiving from the Commission a description of the five basic types of reactors in readily understandable language.

We take for granted that there are disadvantages in some over others and compensating advantages.

The committee would like for the Commission to cover the six points we have compiled as a checklist in order to better understand the comparison.

Admiral Strauss has said that alternate reactor systems are being explored in order to achieve optimum accommodation of these factors. There is, first, high operating temperature; second, simplified fuel fabrication and recovery; third, low-cost fuel inventory; fourth, low plant investment; and, fifth, ease of operation and maintenance.

To Admiral Strauss' own checklist the committee adds still another which appears to be of foremost importance: safety.

So we have six, and we ask the Commission to follow the checklist, a copy of which is now being handed to each of the Commissioners. To facilitate the presentation, we would like the Commission-prepared charts, charts 1 through 9, to be placed before each of the committee members.

Mr. STRAUSS. In the first day I called attention to the fact that although safety was not included in the statement that was prepared for me, I interpolated that I regard it as not less important than any of the five items on the checklist, and the whole Commission does.

We treat it as an essential basic requirement enjoined upon us by our responsibility as Commissioners.

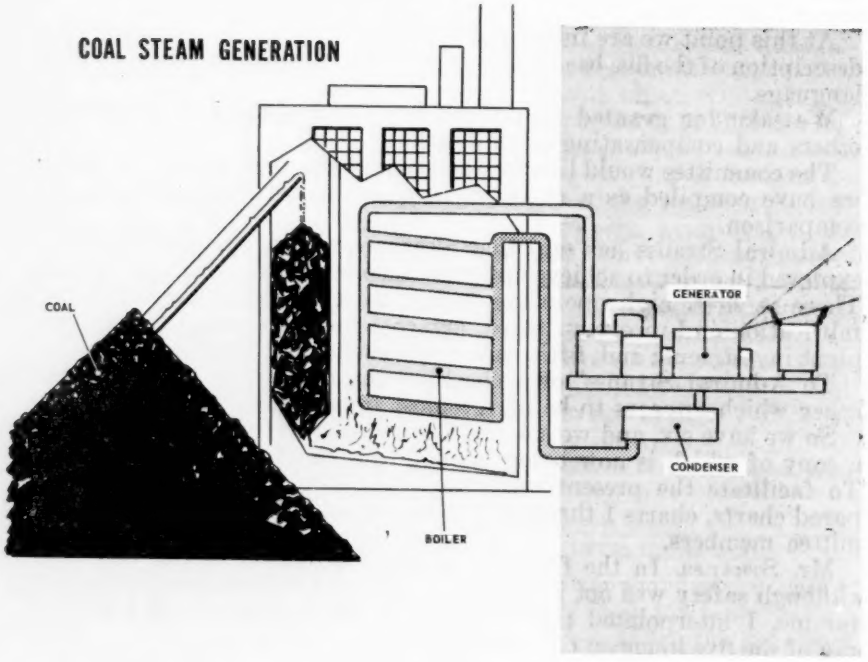
Now, in order that this answer to your question can be put into the most concise and accurate form, might I ask you if I can request Mr. Davis, whose specific charge this is, to describe each of these reactor concepts in brief, lay language?

COAL-STEAM GENERATION

Chairman CANNON. If the committee will turn to chart No. 4—that is the fourth page in the group—we will start with the coal-steam generation.

(The chart referred to is as follows:)

CHART IV



Mr. DAVIS. If the chairman will permit, I would like to go through these reactors for you.

The first chart, No. 4, shows a coal-fired steam plant for purposes of comparison with the later charts, to show the comparable nuclear-fuel steam powerplants.

I think that it is fairly evident what we are trying to make in each case. We have shown on the left-hand side the steam-generating portions of the plant.

The right-hand side in each case is the turbine, which is not identified, generator, steam condenser, and transformer, which are essentially the same in each case.

PRESSURIZED WATER REACTOR

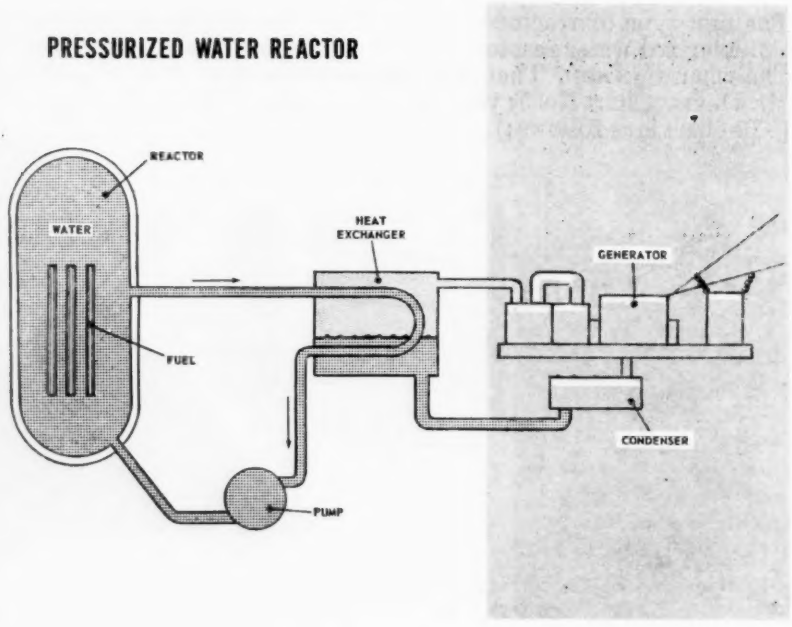
The first type of reactor which has been in our 5-year program is the pressurized water reactor.

Chairman CANNON. That is on the next chart?

Mr. DAVIS. Chart No. 5; yes, sir.

(The chart is as follows:)

CHART V


PRESSURIZED WATER REACTOR
REACTOR
WATER
FUEL
HEAT
EXCHANGER
GENERATOR
CONDENSER
PUMP

Mr. DAVIS. This is the basic type of reactor of which the pressurized water reactor is the large-scale civilian version and which is the same type as the submarine *Nautilus* reactor.

In this reactor ordinary water is the cooling medium and also the moderator which slows down the neutrons to the energy levels where they can be captured easily.

I might stress that it is very highly purified water. We go to a great deal of trouble to make sure it is as pure as possible.

In this case the water goes through the reactor and the fission takes place in the fuel elements, the water is heated, and it is then passed through a heat exchanger, through a pump, and back through the reactor.

Now, the pressure at all times is kept far above the pressure that is required to keep the water from boiling, even at the hottest point in the reactor. We don't want any boiling to take place even at the hottest spot of any one of the cooling elements.

It is kept at 2,000 pounds per square inch.

Mr. JENSEN. May I ask a question?

Chairman CANNON. The gentleman from Iowa.

Mr. JENSEN. On none of these charts do you show where the power comes out that turns the wheel. Of course, I do not know a thing about steam power or reactor power.

Where does this power come out of this reactor that turns the wheel that makes the power?

Mr. DAVIS. Let me see if I can answer your question, sir.

As I pointed out, the arrangement here to the left of the chart is essentially an arrangement for circulation of water past the fuel elements.

What is identified as heat exchanger in this chart is in fact a boiler where the hot water inside the tubes causes water on the outside of the tube to boil.

And then in this heat exchanger, which is essentially a boiler, steam is generated. From this point on we are now dealing with steam.

The steam from this heat exchanger boiler then goes to a turbine in just the way that steam in the conventional powerplant is taken to a turbine.

There is one fairly significant difference. That is that this steam is not superheated. It is not at a temperature above its boiling point. It is essentially at its boiling point.

This steam goes through a turbine where it exerts a mechanical force on the turbine blades and causes the shaft of the generator to turn.

Mr. JENSEN. Where does this steam that turns the turbine leave the reactor, at what point?

Mr. DAVIS. There is no steam in the reactor, in the pressurized water reactor.

Mr. STRAUSS. It may be said that being a layman, as well as yourself, I can convey my information to you in terms that we will mutually understand.

The water which comes out of the reactor and which follows this loop indicated by the arrows through the pump and back into the reactor is very hot. It is much hotter than the heat required to boil water at atmospheric pressure, because that water is under 2,000

pounds per square inch of pressure, which restrains it from boiling.

These pipes with the water in it pass through a box which is here marked "heat exchanger." That box is partially filled with water at atmospheric pressure. It is cooler, very much cooler, than the water coming out of the reactor.

It absorbs heat from those pipes, and becomes hot and does boil and produces steam which is shown in the light colored part of that square, and that steam then flows into the turbines which are not marked, but which are still used as the two small squares on the left of the generator.

That is the turbine. The steam spins the blades of those turbines, which in turn rotate the generator and that produces electrical energy in the ordinary manner.

Mr. JENSEN. It does not make much difference whether I understand this, or not, but in the interest of the public and these students that might take this up, if they know it as you have told it, they might say, "Now, I am beginning to understand it; I am beginning to understand how this atomic reactor operates. Maybe I had better look into it a little farther."

Now, that may be insignificant, but I am a very ordinary layman and the first thing I thought when I saw that chart of an atomic reactor was where does the power come out that turns the wheel? I think that is what most laymen will wonder. That is why I asked the question.

Chairman CANNON. As I understand it, Admiral Strauss, this is merely a substitution for the fossil fuels and after the heat is once developed the production of electricity proceeds in the conventional way.

Mr. STRAUSS. That is right, Mr. Chairman.

Mr. Chairman, might I as a matter of personal privilege call your attention to the fact that in my testimony on the first day, in connection with this checklist, I testified as follows:

> To achieve lower cost for nuclear power alternative reactor systems are being explored. Each system seeks an optimum combination of such factors as—

and then my list comports with yours, and then I added,

> I think there should be an additional factor, safety.

Chairman CANNON. You did not include that in the schedule before us, but will you now include it and develop it as we go along?

Mr. STRAUSS. My point was that I had included it, Mr. Chairman, in the course of the oral presentation of my statement. It was not in the copy that had been prepared for me. I sensed its omission as I was reading and I interpolated it at the time as the record shows.

Chairman CANNON. Let us take up the boiling-water reactor, as found on chart 6.

Mr. DAVIS. Would you want me to run through your checklist in connection with the pressurized-water reactor?

Chairman CANNON. If you will.

Mr. DAVIS. First, with respect to safety——

Chairman CANNON. We would like to have, as you go along, your comments on these six points:

Safety, high operating temperatures, simplified fuel fabrication, low-cost fuel inventory, low plant investment, and ease of operation and maintenance.

Discuss each reactor from these six points of view, if you will.

Mr. DAVIS. First, with respect to safety, this reactor, I would say, we would consider normal from the point of view of safety.

The fission products are contained in the solid fuel elements so that the possibility of their escaping is relatively small.

We do have a high-pressure system with a lot of water under high pressure. If there were a break in the system, one would then get a great deal of steam in the areas surrounding the reactor.

In the pressurized water reactor at Shippingport, in the light of this chart, large steel tanks are so constructed that if the steam were to escape from the system—and the steam would be very slightly radioactive, particularly if there were at the same time any rupture at all of the fuel elements—then these containers would contain all of this steam. There would be no escape from the containers to the outside atmosphere.

"RUNAWAY" REACTOR—CANADA

Chairman CANNON. Was the plant in Canada which got out of control a pressurized system?

Mr. DAVIS. It was a pressurized system, pressurized at very much lower pressure. That reactor was not designed as a power reactor. It was designed as a research reactor and used water for cooling the fuel elements, but the water was not allowed to get up to temperatures anywhere nearly as high as we have in the pressurized water reactor.

Chairman CANNON. Does that directly affect the question of safety?

Mr. DAVIS. Yes.

Chairman CANNON. The question of control?

Mr. DAVIS. Well, the question of control is somewhat different. These pressures always carry with them some possibility of a break in the system and the escape of the high-pressure content of the system in the surrounding area.

The system at Shippingport is so designed that if this should occur, which is not believed to be likely, the steam would still be contained inside of these tanks which completely surround the reactor and these boilers——

SAFETY FACTOR—VARIES IN DIFFERENT REACTORS

Chairman CANNON. Would you say the pressurized water system is as amenable to control as any of the five systems?

Mr. DAVIS. No, there is quite a difference. The pressurized water system, I think, is rather intermediate in this respect. We talk a little bit later about the homogeneous reactor. I will point out that this reactor is a little easier to control.

Chairman CANNON. Would you say it is the safest or the most hazardous?

Mr. DAVIS. I would say it is intermediate.

The high operating temperature is one of the disadvantages of the pressurized water reactor.

We are limited here to temperatures which can be contained at pressures which are feasible from an engineering point of view.

In this reactor the water will be coming out at a temperature of 540° Fahrenheit. This is not a high temperature compared to the present-

day practice in steam plants where temperatures of the order of a thousand degrees are used. So this reactor definitely must be considered to be a relatively low-temperature reactor as compared to modern steam powerplants.

However, I must point out that if the reactor can be built at a reasonable cost, the relatively low operating temperature is not necessarily a reason why it could not make economical power.

But it is not a high-temperature reactor in that sense.

On the point of simplified fuel fabrication and recovery——

Chairman CANNON. That is the third point.

FUEL FABRICATION AND RECOVERY OF PRESSURIZED WATER REACTOR

Mr. DAVIS. Again the pressurized water reactor today has relatively high-cost fuel fabrication and probably relatively higher cost chemical-processing charges.

Now, the reason for this is largely that water is quite corrosive at the temperatures we are talking about here. In order to use materials that don't soak up the neutrons, we have had to go to the use of zirconium and stainless steel, which provide protection against corrosion.

Now, these materials, particularly zirconium, in a pressurized water reactor, are quite expensive. We believe the cost of protection against corrosion can be very substantially reduced and that the cost of zirconium can be very substantially reduced.

On the other hand, it is possible to make use of other materials which perhaps are more expensive in terms of neutrons consumed, but which are less expensive from the point of fabrication.

The Yankee Atomic Electric Co. proposed water reactor makes this kind of compromise. They plan to use for cladding of fuel elements stainless steel, which is less economical from the point of view of the neutrons absorbed, but which may lead to cheaper fuel fabrication cost.

This is one of the things we would like to study; in the end it may result in the greatest economy.

At the present time I would have to rate the pressurized water reactor as relatively expensive from the point of fabrication.

COST FOR FUEL INVENTORY

On the fourth point, the cost for fuel inventory, this reactor rates relatively low.

Now, here I would like to point out that we must consider not only the fuel in the reactor, but also the amount of fuel in fuel elements being fabricated, the amount in the fuel elements being stored prior to processing, and the amount of fuel in the material actually being processed.

You have to take this all into account in considering the inventory.

So the amount in the reactor should not be considered alone.

Here you would have, of course, fuel elements fabricated, a fair amount of material in the reactor and a considerable amount in the cooling and processing phases.

I would say that this reactor was rather intermediate among those that we have with respect to the fuel inventory aspect of its operation.

PLANT INVESTMENT

Chairman CANNON. How about the matter of low plant investment?

Mr. DAVIS. Again there has been quite a bit of comment that the cost of the pressurized water reactor at Shippingport would be of the order of $625 per electrical kilowatt, if you rate the plant at 60,000 electrical kilowatts as its normal capacity.

Chairman CANNON. That is one of the largest?

Mr. DAVIS. This is the first large size power reactor. Now, actually, the Duquesne Light Co. is installing a 100,000 electrical kilowatt generator. If the plant turns out to be able to produce this much heat and, therefore, this much power, the investment cost will drop down to something of the order of $375 per electrical kilowatt.

You must bear in mind that this is the first plant of this type which has been built and that their capacity may in fact be even greater than this. In this case we see no reason to believe that the investment for the pressurized water type of reactor might not in fact get down to the range comparable with the other types of reactors which we are considering.

OPERATION AND MAINTENANCE

Chairman CANNON. The last point is "operation and maintenance."

Mr. DAVIS. This we believe is quite a simple reactor to operate and maintain. I believe that Admiral Rickover's experience with the STR at Idaho and the experience with the pressurized water reactor on the *Nautilis* bear this out.

It has, in fact, a minimum cost of operation, a minimum requirement for maintenance. In fact, maintenance can be carried out on these reactors more easily than we had in fact anticipated.

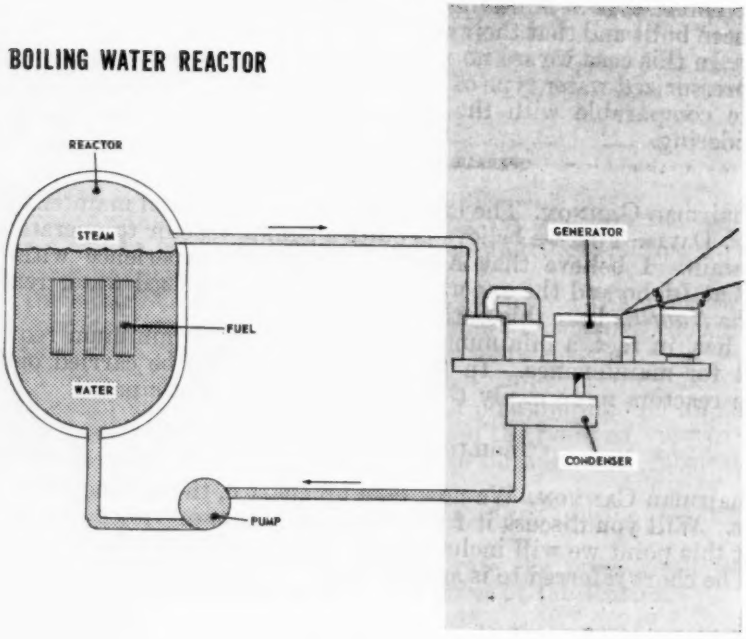
BOILING WATER REACTOR

Chairman CANNON. We now take up chart 6, the boiling water reactor. Will you discuss it from these six points of view?

At this point we will include chart No. 6 in the record.

(The chart referred to is as follows:)

CHART VI


BOILING WATER REACTOR
REACTOR
STEAM
FUEL
WATER
GENERATOR
CONDENSER
PUMP

Mr. DAVIS. The boiling water reactor differs from the pressurized water reactor in that instead of operating the reactor under very great pressure, we here allow the steam to boil in the reactor.

In other words, as the fuel elements heat up the water, the steam is allowed to form in the reactor itself.

I might explain why this simplication was not originally contemplated. Because the boiling is a rather erractic type of reaction, it could lead to considerable variations in the power level of the reactor.

It was not know whether it would be possible to control such a reactor easily. This was the principal reason why the pressurized water reactor was in the early days thought to be preferable, at least to the extent that there was any knowledge about the boiling water reactor.

Dr. Zinn built at Idaho a small boiling water reactor to test this system. This is what was called the borax I experiment. It was a relatively simple and cheap experiment to find out whether a reactor operating with the water boiling could be controlled.

What he found was that it did in fact have control characteristics.

SAFETY FACTOR

Chairman CANNON. Is it practicable from the point of view of safety?

Mr. DAVIS. Yes, there are really two problems here that I think ought to be kept separate.

One of them is the ease of controlling the reactor and the other is the safety characteristics. These are not always completely related.

Chairman CANNON. The fact that it is amenable to control does not necessarily mean it is safe?

Mr. DAVIS. The fact that you can easily control it from the operating point of view does not necessarily mean that all reactors which can be so controlled are in fact safe.

Chairman CANNON. Just what do you mean by safe?

Mr. DAVIS. Here I am concerned about the possibilities of meltdown of the reactor core, release of fission products into the coolant, or the emptying of the coolant into the surrouding area. There is also the question of whether you can obtain any kind of low-order nuclear explosion.

There is one other consideration that should be mentioned: That is the possibility that one might get a reaction between the coolant and either the cladding material on the fuel elements, or the fuel element itself. For example, at very high temperatures one can get aluminum and water to react chemically.

The same is true of zirconium and magnesium at very high temperatures. Almost all the light metallic elements will react with water at high temperatures.

DISASTER POSSIBILITY FROM NUCLEAR REACTORS

Chairman CANNON. There has been some discussion of the possibility that one of these reactors might get beyond control and become a menace to the local community. Do you think there is a present possibility of that?

Mr. DAVIS. No, sir; I do not.

Chairman CANNON. You do not think there is any particular danger to the local community in any of these reactors? We have been told that the danger is so acute that none of these reactors should be located near a populated area.

Mr. DAVIS. I certainly don't hold that opinion. I believe it is necessary to design the reactors so that they have the greatest safety that can be obtained.

I believe that the precaution of enclosing them in general gas-type containers is a very worthwhile precaution. I believe, having done that, that the reactors then are quite safe.

Chairman CANNON. Commissioner Murray, what would you say about the advisability of placing these reactors at some distance from larger cities for the sake of safety?

Mr. THOMAS E. MURRAY. I think, as Mr. Davis has indicated, if you take the proper precaution, you don't need to worry about that hazard. It will always be present; it will always be there. There is that one-in-a-million chance that something might happen.

But I do not believe that we should be concerned to a great extent about the location of these reactors. I don't think you would want to put them on the corner of 42d Street and Broadway, but I do believe that we should take ordinary precautions, as these various private industries intend to do, to put them at a reasonable distance from populated areas. They do that for two reasons:

One, land is cheaper and transmission is not as difficult as it used to be.

But I don't believe that the hazard situation in reactors as a whole is something that should deter us from moving ahead.

Chairman CANNON. With the adoption of proper precaution——

Mr. THOMAS E. MURRAY. Extraordinary precaution. It is a different kind of precaution that you take in the operation of an ordinary steam plant.

Mr. PHILLIPS. The chairman started to refer to each of these six types and to ask a series of questions separately regarding each one.

Now, I think your last 2 questions referred to all 6, did they not? You were not referring only to the boiling-water reactor?

Chairman CANNON. The last two questions were general.

Mr. PHILLIPS. Did Mr. Davis' answer refer to all five, or to the boiling-water reactor?

Chairman CANNON. We are dealing primarily with the boiling-water reactor, but the last two questions were general.

Mr. PHILLIPS. How about the answer? Did they refer to all five?

Mr. DAVIS. Yes.

I should point out there are differences between the reactors.

Chairman CANNON. You say there is a minor percentage of danger. What would that one millionth chance of danger be?

Mr. THOMAS E. MURRAY. That is a problem, Mr. Chairman, that has been discussed back and forth with our reactor safeguard committee, with the insurance companies, and with other interested parties.

You have a material here that is in itself dangerous, different from coal or oil. Under those circumstances you take the proper precautions of control and enclosure construction which seem reasonable.

In the extreme case of sabotage, somebody could get into a plant and cut off all the safety arrangements and do this, that, or the other thing. Then you get into this other question of a big hazard.

But outside of that, I think, as Mr. Davis has stated here, we have recognized the problem of safety. We are learning every day more about how to control these reactors, and I do not anticipate any great difficulty in getting insurance on reactors as experience develops.

"RUN AWAY" REACTOR—CANADA

Now, you mentioned the fact that an experimental reactor, in Canada, went bad. There was a failure there and I am not trying to designate whether it was a human failure or mechanical failure. Something did not work, but from that experience we have learned a little more about control rods and controlling of reactors.

Chairman CANNON. Off the record.

(Discussion off the record.)

INSURANCE PROBLEM

Chairman CANNON. Back on the record. There is a hazard sufficient to warrant application for insurance?

Mr. THOMAS E. MURRAY. Yes.

Chairman CANNON. You consider insurance essential?

Mr. THOMAS E. MURRAY. Yes. I don't think any of the private concerns would be justified in building a reactor of this kind and exploring it in this new art without getting some kind of insurance protection.

Chairman CANNON. The committee has examined other statements made by responsible scientists in this field. We find, for example, that Francis McCune, who is the vice president of General Electric Co. in charge of atomic energy, testified recently, as follows:

The gravest problem now facing the atomic energy business is that of liability for the consequence of atomic incident. * * * The testimony you have already heard is to the effect that a serious reactor incident—

And by that I take it for granted he means accident—

is very unlikely, and that, if one occurred, it could be of a catastrophic proportion. * * * You may ask whether the possibility of a catastrophic incident isn't so remote as to be negligible. The answer is that it is remote. But the question is, "How remote?" And this is a question which I believe no one can answer. We have not yet had enough years of reactor operation, and each new reactor is more or less unlike each prior one. In such a situation no clear-cut determination of probabilities can be made.

Then he reaches this conclusion. He said:

In my judgment—and, I think, in the judgment of most scientific and engineering people—we simply cannot dismiss as not worth worrying about the possibility of a major reactor incident.

Now, I will ask Admiral Strauss if he takes exception to this statement by Mr. McCune.

Mr. STRAUSS. No, I do not.

Chairman CANNON. You think it is very well put in that language?

Mr. STRAUSS. I think it is well put.

Chairman CANNON. This is the type of reactor that General Electric is building at Chicago, I believe?

Mr. STRAUSS. That is correct.

Chairman CANNON. It is to be of 180,000-kilowatt capacity?

Mr. STRAUSS. Yes.

Chairman CANNON. Does General Electric think this is the most promising type? Have they selected this type as the most practical?

Mr. DAVIS. They had worked with the Nuclear Power Group, which is in fact proposing this reactor. They studied several and this is the one which they felt, as I understand it, was sufficiently far advanced and sufficiently promising to permit them to go ahead.

I believe the same group has looked at other types of reactors and feels that in the long run there may be other satisfactory types, too.

Chairman CANNON. In view of the fact that we have a conference report on the floor at 12 o'clock we will discontinue at this point.

Hearings will be resumed at 2 o'clock.

AFTERNOON SESSION

Chairman CANNON. Admiral Strauss, will you continue your statement?

Mr. STRAUSS. Thank you, sir.

Mr. Davis was testifying for the Commission on these several reactor concepts and obedient to your question was relating these concepts to the checkpoints in the memorandum which you distributed to us this morning.

With your permission, having discontinued the morning session when we reached the boiling-water reactor, we will resume at that point.

Chairman CANNON. If you please.

Mr. STRAUSS. Thank you, sir.

Mr. DAVIS. Thank you, Mr. Chairman.

COMPARATIVE POINTS OF BOILING-WATER REACTOR

As I outlined very briefly this morning, the boiling-water reactor differs from the pressurized-water reactor in that the water in the reactor is permitted to boil and the steam that is so generated goes directly to the turbine rather than going through an intermediate heat exchanger.

I think in connection with the control and safety problem, I should point out one safety feature in this type of reactor. If the fuel elements tend to become overheated, they will then have the effect of boiling more water and will force the water itself out of the core of the reactor.

Since this action, then, takes away the moderator which is slowing down the neutrons, the reactivity of the reactor is thereby decreased and the effect is that the reactor shuts itself off.

Now, we have through a series of experiments at Idaho tested this theory and shown that this does in fact happen. Even though you take the control rods out very suddenly, it will under most any conditions shut itself off.

I might point out, to go back to the question of control and the relationship between control and safety, that this is in fact almost the opposite of what we would like to have happen from the point of view of control. What happens if the turbine, suddenly gets an increase in the power demand is that the pressure goes down in the turbine. This reaction causes more water to boil in the reactor, shuts down the power level of the reactor, and decreases the power level of the reactor.

The result, then, is just the opposite of what you would like to have happen in order to have good control characteristics of the reactor from the point of view of generation of power.

So that in some respects we have good control from the point of view of safety, but in other respects we have a poorer control from the point of view of the utilization of the machine that produces power.

I merely cite this as an example of the fact that control and safety are sometimes not both favorable in the same direction.

Now, the safety of this reactor from the point of view of nuclear hazards is very similar to that of the pressurized water reactor. It again is a high-pressure system, but it might operate at perhaps at 600 pounds compared to 2,000 pounds in the pressurized water reactor.

The advantage here is that one can in fact get about the same temperature in this reactor, but without as high a pressure. You can in fact get appreciably higher temperatures in the pressurized water reactor, but you get them in a somewhat lower pressure system.

The reason for that is that, if one increases the temperature of the boiling water, the pressure goes up very rapidly between 500 and 550 degrees.

In fact, water boils at something over 3,000 pounds of pressure at slightly over 700°.

So whether the reactor is a pressurized, or whether it is a boiling-water reactor, it still is going to operate in the intermediate temperature range.

I might make one other observation on the boiling-water reactor. That is that this reactor could utilize light water or heavy water.

Now, the version planned by Commonwealth Edison is in fact a light water reactor. In the experimental reactor which we are building at Argonne we plan to start up with light water. We plan in the experimental program at Argonne to put in a new set of fuel elements and to charge it with heavy water, to try operating the reactor with heavy water.

(Discussion off the record.)

SAFETY CONSIDERATIONS

Chairman CANNON. On the record.

On May 14, last, Dr. Charles G. Manly, Chief of Policy and Program, of the Branch of Civilian Application, United States Atomic Energy Commission, in a presentation before the eastern New York chapter of the American Society of Safety Engineers, said:

> In the event of a large-scale disaster, it would be hoped that even in the worst case only a small fraction of the contained radioactivity would be released into the reactor building and that this could be contained there. If the building were not perfectly gastight, some fission products might leak out in the event of a major accident. The harmful effects of such a leak can be reduced by controlling a sufficient land area to insure some degree of atmospheric dilution before the contaminated air reaches the public.

What would you say is the accuracy of that statement, and what would be the effect if one of these reactors would get out of control as it came very near doing in Canada? What would be the effect upon the surrounding terrain and population, if any?

Mr. DAVIS. I think the comment on the building bears on the point that the fission products themselves are contained in the fuel elements.

These are generally metallic and have a cladding around them, so that to escape the fission product must somehow rupture the fuel element.

It is not believed that in most cases a sufficient fraction of the fuel elements would be so ruptured. In some cases the coolant material itself, particularly when sodium is used, picks up considerably more induced radioactivity than does water. The coolant would also carry with it the hazard of spreading radioactivity in the building, but still in far smaller quantities than the amounts contaned in the fuel elements in the core itself.

Now, of course, these reactors are generally contained in pressure vessels of some sort. Even the little pressure vessels are in a tight container so that you have to rupture this container as well in order to release this radioactivity in the building.

These container vessels are generally designed to contain all of the activity that is released even in the event that all these things do happen.

If you postulate further a rupture of the container vessel, then there would be some escape of fission product activity in the air.

This radioactivity would be borne by the wind and go in whatever direction the wind happened to be blowing. The volume of air would gradually become mixed and diluted. However, this radioactivity could be carried a considerable distance.

Chairman CANNON. The danger would be from diffused radioactivity?

Mr. DAVIS. It would come from the settling out of this airborne radioactivity on to the ground from the cloud downstream from the plant.

Chairman CANNON. That might be very insidious; it might not be at first recognized.

Mr. DAVIS. It could only be detected with counting apparatus. But certainly if there were such an event measures could be taken to make sure to track any possible release.

Chairman CANNON. I note in Dr. Manly's statement here that he says the harmful effects of such a leak could be reduced by controlling a sufficient land area. Now, what is meant by a "sufficient land area"?

Mr. DAVIS. I don't know what would be considered to be an adequate land area.

Chairman CANNON. That would mean that the plant should be so far isolated that in the event of such an incident it would be far enough removed from a populated center as not to endanger the people in that area.

Mr. DAVIS. The dilution factor would cut down the possible fallout of activity to a point where it no longer would be harmful.

Chairman CANNON. It would take quite an area to so isolate the plant that this radioactivity would not affect a large number of people?

Mr. DAVIS. If one assumes that all of the radioactivity in the reactor somehow gets into the air, which is a most unlikely circumstance, it assumes that all of these other safeguards have in fact failed, then the distance might be quite large.

Chairman CANNON. Apparently this precaution is not being taken. All these reactors are near or in the suburb of large cities.

Mr. DAVIS. The Shippingport reactor, for example, is about 25 miles from Pittsburgh. It is not really very close to Pittsburgh.

Chairman CANNON. Would you say that that distance involves sufficient area to afford protection?

Mr. DAVIS. We certainly believe that it does.

Now, this estimate is based on our evaluation of what the possibilities are. Certainly when we have very large production reactors, or when we have experimental reactors, which might be hazardous and are not placed in air-tight containers, we would put those reactors in areas like Hanford, Savannah River, or Idaho.

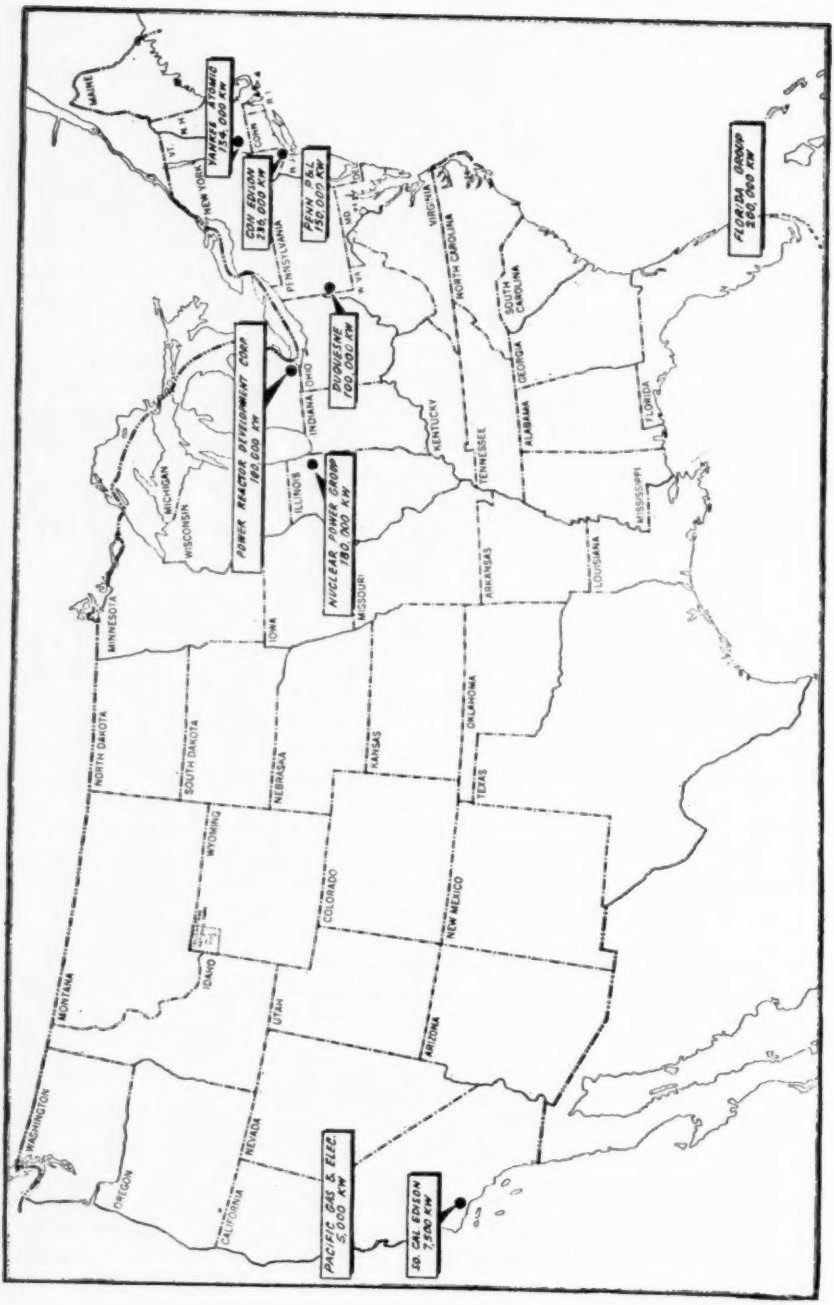
PROXIMITY OF NUCLEAR POWER PLANTS TO CENTERS OF POPULATION

Chairman CANNON. In the hearings before the Joint Committee on Atomic Energy, February 29 and March 6, you included a map as shown on page 541, in which you indicated the location of some of these proposed reactors. For example, here is one, Pacific Gas & Electric, 5,000 kilowatts, at San Francisco.

We will print the map in the record at this point.

(The map is as follows:)

EXHIBIT II


YANKEE ATOMIC 134,000 KW
CON EDISON 236,000 KW
PENN P&L 150,000 KW
DUQUESNE 100,000 KW
POWER REACTOR DEVELOPMENT CORP 100,000 KW
NUCLEAR POWER GROUP 180,000 KW
FLORIDA GROUP 200,000 KW
PACIFIC GAS & ELEC 5,000 KW
SO. CAL. EDISON 7,500 KW
MAINE
VT.
N.H.
NEW YORK
CONN.
R.I.
MASS.
PENNSYLVANIA
N.J.
MD.
DEL.
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TENNESSEE
KENTUCKY
INDIANA
OHIO
ILLINOIS
MICHIGAN
WISCONSIN
MINNESOTA
IOWA
MISSOURI
ARKANSAS
OKLAHOMA
TEXAS
KANSAS
NEBRASKA
SOUTH DAKOTA
NORTH DAKOTA
NEW MEXICO
COLORADO
WYOMING
ARIZONA
UTAH
NEVADA
IDAHO
MONTANA
OREGON
CALIFORNIA
WASHINGTON

How close is that to the heavily populated area of San Francisco?

Mr. DAVIS. That is in the Livermore Valley, which is about 10 or 15 miles from the southern part of Oakland, which I think is the largest heavily populated area.

Chairman CANNON. Would you say that is far enough out to protect the people in that area?

Mr. DAVIS. Yes, sir.

Chairman CANNON. Then again we have the Detroit Edison reactor near Detroit, how far is that removed from the center of the city?

Mr. DAVIS. I believe it is about 15 or 20 miles; something of that sort.

Chairman CANNON. You think that distance is sufficient precaution.

Mr. DAVIS. I believe that is adequate distance.

Chairman CANNON. Incidentally, I might add that it involves the production of 100,000 kilowatts.

Mr. DAVIS. That is correct.

Chairman CANNON. You would not say that it is too close to the city?

Mr. DAVIS. No, I do not believe so.

Mr. RABAUT. How close is it to Monroe?

Mr. DAVIS. It is considerably closer to Monroe. I don't know the exact distance.

Chairman CANNON. Here is the Yankee Atomic, 154,000 kilowatts, near Springfield, Mass. What would you say of that plant?

Mr. DAVIS. I am not sure. It is in a fairly remote location.

Chairman CANNON. It is your impression that all of these installations are a sufficient distance from large cities to avoid serious menace?

Mr. DAVIS. Yes.

I should point out that the reactors at Savannah River are about 30 or 35 miles from Augusta and we have a rather large city near the Hanford installation, Richland.

Chairman CANNON. You may proceed.

BOILING WATER REACTOR

FUEL FABRICATION AND RECOVERY, AND OTHER POINTS

Mr. DAVIS. On the subject of simplified fuel fabrication and recovery, again I would class the boiling-water reactor as being very similar to the pressurized water reactor. The fuel elements must stand up to relatively high temperatures, essentially the same as in the pressurized water reactor, with one difference: the elements are spaced somewhat further apart in the boiling-water reactor due to the fact that the water is boiling.

This fact does lead to a little less severe requirement for mechanical tolerance and other design features.

The chemical processing problem is almost identical, I would say.

COST OF FUEL INVENTORY AND INVESTMENT

On the subject of the cost of the fuel inventory, again the inventory is modest. Again it includes material fabrication and processing.

On the plant investment, again the possibility seems fairly good. The contract cost of the Commonwealth Edison reactor is $45 million

for the 180,000-kilowatt plants which is of the order of $250 per electrical kilowatt.

For the first large plant, that does seem quite attractive. And I would——

Mr. ANDERSEN. How does that compare with Grand Coulee, in relation to contract cost to kilowatt production?

Mr. DAVIS. I am sorry; I don't know the figures for Grand Coulee, but we can provide them.

(The following information was provided by the Bonneville Power Administration:)

Schedule 4, page 1, of the General Accounting Office Audit Report shows that as of June 30, 1955, the plant investment allocated to commercial power was $221,108,674. Based on electric generating capacity of 1,944,000 kilowatts, the investment per kilowatt at Grand Coulee was therefore $113.74.

I might say a modern, large conventional steam plant is today of the order of $120 to $130 a kilowatt. I know that in some areas hydro installations being made strictly for power purposes are of the order of $300 to $325 a kilowatt.

(Discussion off the record)

Chairman CANNON. Did you conclude point 6?

Mr. DAVIS. I wanted to remark on the cost of operation and maintenance. We would not feel that this recator would be any different from the pressurized water reactor with the exception that here we are taking steam directly from the recator. The steam has some slight amount of radioactivity, and it goes directly into the turbine.

Here there is the problem of making the system more leaktight, with seals on rotating equipment, more leaktight than is the conventional practice.

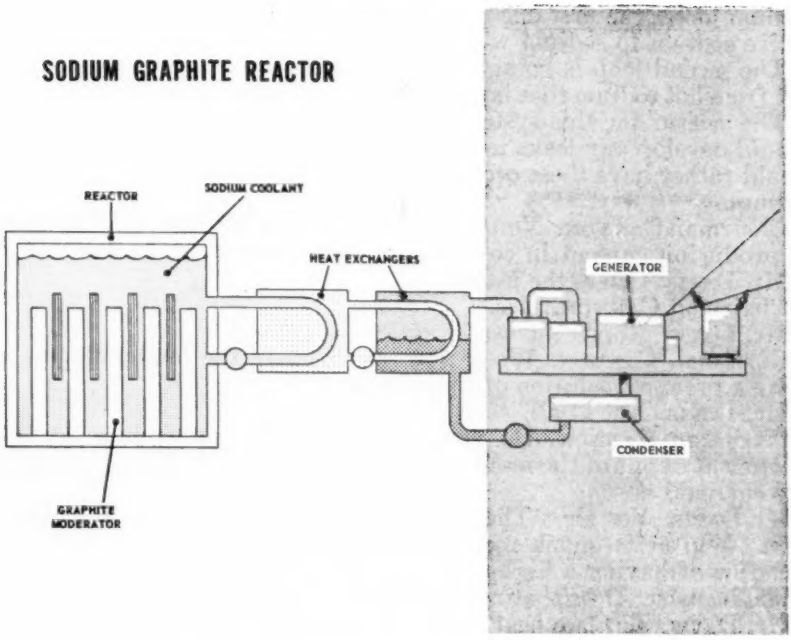
On the thermal boiling-water reactor, the people who are building a turbine have made a guaranty of very low losses.

SODIUM GRAPHITE REACTOR

Chairman CANNON. Passing on to the sodium graphite reactor, we will include chart No. 7.

(The chart referred to is as follows:)

CHART VII


SODIUM GRAPHITE REACTOR
REACTOR
SODIUM COOLANT
HEAT EXCHANGERS
GENERATOR
CONDENSER
GRAPHITE MODERATOR

Chairman CANNON. Is there anything unusual here or anything that varies materially from the others you have discussed?

Mr. DAVIS. The sodium graphite reactor is different from the ones we have talked about in that the liquid sodium is used as the coolant. This gives you two advantages:

One is a very much greater ability to go to high temperature. We get temperatures more nearly approaching the modern coal-fired plant.

The other is that the pressure is much lower.

We have here a lower pressure, high-temperature system. One of the disadvantages is that the sodium in the reactor becomes much more radioactive than water in a water-cooled reactor.

In the first plant shown here in the chart we plan to have two sodium loops, the first one would be exchanging heat from the radioactive sodium to sodium which does not go through the reactor.

The second loop is going through the boiler and producing steam, but from hot sodium that is not in itself radioactive.

The reason for this system again is safety. We feel that if there should develop any leaks in the sodium and water heat exchanger we would rather have these occur with nonradioactive sodium than with sodium.

Chairman CANNON. You would say this method offers what prospect of producing current in competition with conventional methods?

Mr. DAVIS. Offers the least?

Chairman CANNON. Yes.

Mr. DAVIS. No, sir; it would not.

Chairman CANNON. Woud you say it offers the least prospect of being a practical solution of the question?

Mr. DAVIS. Not at all.

Chairman CANNON. Do you think it offers opportunity for development of one of the more practical methods of producing competitive current?

Mr. DAVIS. Yes, sir. The big advantages here are the high temperature. You get a much more efficient plant and freedom from the necessity of having a high——

Mr. RABAUT. Does that result from the two heat exchangers?

Mr. DAVIS. The two heat exchangers are just a safety precaution to avoid exchange of heat between radioactive sodium and water.

The high efficiency comes from the fact that sodium can be heated up——

Mr. RABAUT. Your heating element comes on the first chart?

Mr. DAVIS. The heating element heats the sodium and we believe that temperatures of a thousand degrees are ultimately obtainable in this type of reactor.

First, it is 550 degrees in the pressurized water reactor.

Mr. RABAUT. What is in this first heat exchanger?

Mr. DAVIS. That is simply sodium exchanging heat to cooler sodium.

Mr. RABAUT. This is the only place where you have two of them?

Mr. DAVIS. Also in the fast breeder reactor.

Chairman CANNON. Have you made as much progress on the sodium graphite methods as you have on the other methods?

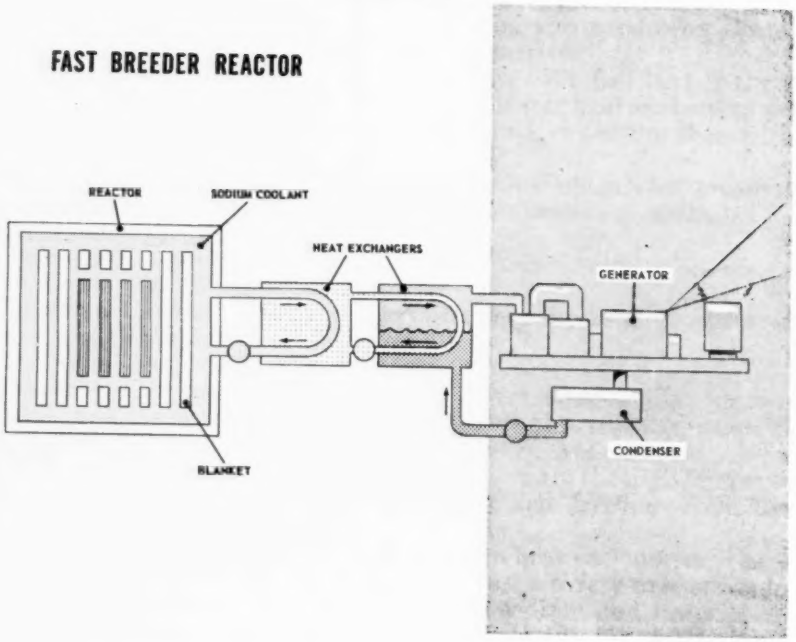
Mr. DAVIS. I believe so. There are, I would say, however, still some serious problems concerned with the corrosion and the effect of sodium on material at high temperature. It is a more difficult job in many respects——

FAST BREEDER REACTOR

Chairman CANNON. On the fast breeder reactor, and we will include here chart No. 8, which gives us a brief summary of that.

(The chart referred to is as follows:)

CHART VIII


FAST BREEDER REACTOR
REACTOR
SODIUM COOLANT
HEAT EXCHANGERS
GENERATOR
CONDENSER
BLANKET

Mr. DAVIS. The fast breeder reactor is intended, as Dr. Libby pointed out, this morning, to give us the possibility of making more fissionable material than is actually consumed. The way this is done is to have a reactor in which there is no moderator.

In other words, one does not attempt to slow down the neutrons, but attempts to capture them in additional material when they are still at high energies.

This system leads to a very compact reactor. The difficulties here are largely associated with the fact that it is a very small reactor.

We spoke this morning about the amount of heat coming out of a given volume in the core of a fast reactor. The amount of heat becomes quite extreme.

Let me say that the core is a very compact assembly of fairly highly enriched uranium. Enrichment reaches probably 20 and 30 percent in a fast reactor assembly. This use of fast neutrons does give rise to some safety considerations that are not presently found in some other types of reactor.

One does have a greater possibility here of getting a release of nuclear energy than one does in some of the other reactors I have mentioned.

So on the safety point I think this is one reactor which deserves special mention.

The advantage, aside from the possibility of producing more fuel than is actually consumed, which is a very substantial amount, again is the high temperature that can be obtained in sodium coolant.

The point of low fuel cost inventory deserves mention because inventory in this type of reactor is quite high. One requires a rather high proportion of expensive fissionable material in the reactor as compared to some of the other reactors.

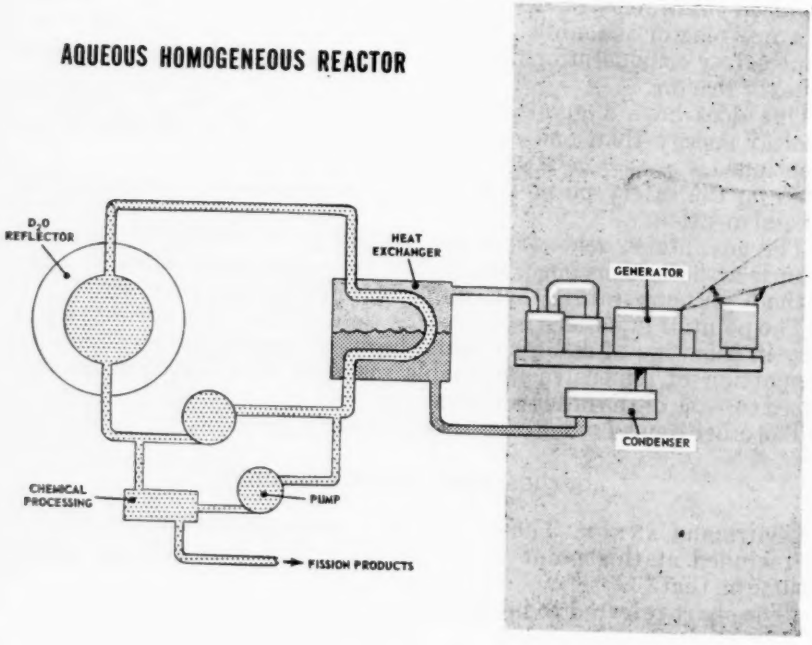
The other items I would say are very nearly the same.

AQUEOUS HOMOGENEOUS REACTOR

Chairman CANNON. The aqueous homogeneous reactor, chart 9, will be included at this point in the record. Will you give us a brief résumé on that?

(The chart referred to is as follows:)

CHART IX


AQUEOUS HOMOGENEOUS REACTOR
D_2O REFLECTOR
HEAT EXCHANGER
GENERATOR
CONDENSER
CHEMICAL PROCESSING
PUMP
FISSION PRODUCTS

Mr. DAVIS. That reactor differs quite markedly from those we have discussed. Here the fuel material is in the form of a uranium salt dissolved in heavy water. The fuel material itself then acts as the moderator and as the coolant.

The reactor consists simply of enough of the fuel material in one place to generate the reaction and, as soon as it becomes heated, it passed out through the heat exchanger.

This reactor has inherently a very strong safety factor in that the heating of the fuel material itself simply causes it to be expelled from the reactor.

So it is a very good reactor from a safety point of view. It is also easily controlled for the same reason. It is, however, from the point of view of routine operation somewhat more hazardous since one now has a complicated plumbing system, which contains the very highly radioactive fuel solution.

The reactor again, being a water-cooled reactor, is limited to intermediate temperature ranges and must operate at high pressure, again of the order of 1,000 to 2,000 pounds.

From the nuclear economy point of view it is very good. We believe that by utilizing thorium this reactor will breed just as a fast reactor does.

The reason is obvious: We don't have any structural material in the core of the reactor to absorb the neutrons that could otherwise be used for breeding.

The fuel inventory in the reactor is very small. The fuel inventory in fabrication of course is very small and the processing we expect to carry out adjacent to the reactor.

From the point of view of fuel fabrication and recovery, this reactor comes very near the ultimate with low-cost fuel inventory. This is certainly one of the big advantages of this type of reactor.

EASE OF OPERATION AND MAINTENANCE

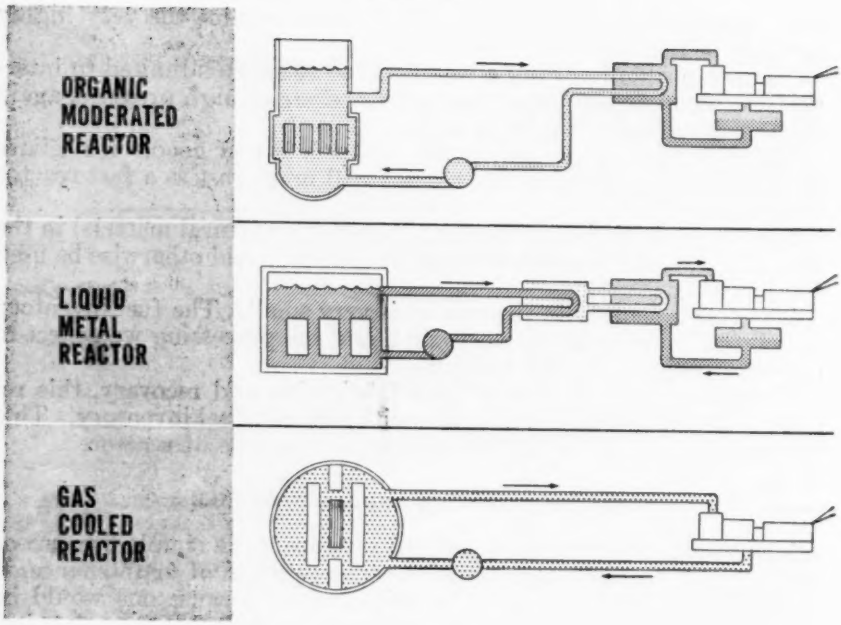
The operations, as I have pointed out, are quite simple because of the inherent control characteristics. The problem of maintenance, if one should get a leak, might be quite serious because one would be getting leaks of very highly radioactive material.

So I would have to say that the maintenance problem might be rather severe.

REACTOR CONCEPTS 6, 7, AND 8

Chairman CANNON. To complete the picture, we will insert in the record at this point chart X, in order to provide an understanding that the additional 3 basic reactor concepts are different from the first 5, and in turn different from one another.

CHART X


ORGANIC
MODERATED
REACTOR
LIQUID
METAL
REACTOR
GAS
COOLED
REACTOR

CONSTRUCTION AND OPERATION OF FIVE BASIC REACTORS

Chairman CANNON. None of these proposed reactors is to be constructed by, or to be operated by, the Commission. You farm them out?

Mr. DAVIS. Are you speaking of experimental ones?

Chairman CANNON. Does the Commission itself construct or operate any of them?

Mr. DAVIS. Well, the Commission contracts for their construction and operation with the national laboratories and with some of the industrial contractors who are doing this development work for us.

Chairman CANNON. In that process do you assign the specific reactor to a specific contractor, or do you ask the contractor to take his choice?

Mr. DAVIS. This program has grown up over the years in the sense that certain of the laboratories and contractors have become interested in particular types of reactors and have generally proposed to us development work along these lines which we have usually been supporting.

For example, Argonne was instrumental in developing the general concept for the boiling-water reactor and proposed to us the boiling-water reactor experiments.

So we did contract with them for this project. It was really a meeting of the minds rather than a direction on our part or the completely free choice at every point on their part. They more or less committed themselves to a line of endeavor.

INSURANCE PROBLEM

Chairman CANNON. The executive officer of one of these contracting firms made the statement which was repeated here to the effect that the danger was so great that, until some arrangement was made whereby they would be assured of indemnification, they did not propose to start construction of the reactor assigned to them.

In just how many other instances is that true?

Mr. DAVIS. This situation applies, I believe, to the licensed reactors and to the power demonstration reactors only. In these cases, but with one possible exception, I don't believe that any of them have indicated they would be willing to go ahead without some form of public liability insurance.

Chairman CANNON. That being true, you are at a standstill at this time?

Mr. DAVIS. No, because many of them are going ahead on the assumption that such insurance will become available.

Chairman CANNON. But they have not yet reached the point involving danger and will not start construction until they have some assurance on that score?

Mr. DAVIS. That is right.

Chairman CANNON. So, when they have reached that stage of construction and development you will have reached a stalemate?

Mr. DAVIS. I believe most of them are planning to go ahead, at least to a certain point. But beyond that point, they will not proceed.

Chairman CANNON. When that point is reached you are at a standstill?

Mr. DAVIS. At that point you would be stymied; yes, sir.

Chairman CANNON. How do you propose to meet that situation?

Mr. DAVIS. Well, we hope that such insurance will be available from industry to a certain extent and that some measures will be taken by the Government.

Chairman CANNON. What measures are you recommending?

Mr. DAVIS. I think I had better let one of the Commissioners speak on that subject.

Mr. STRAUSS. We recommended legislation to the Joint Committee, Mr. Chairman. A substitute measure was introduced by the chairman of the Joint Committee, and the Commission has indicated its willingness to endorse that measure although in some respects it differs from the proposal which we had offered.

Chairman CANNON. In what respects, Mr. Chairman?

Mr. STRAUSS. I was away during the week in which there was testimony on the subject. I believe Commissioner Vance represented the Commission at that hearing. Am I correct?

Mr. VANCE. That is right.

Mr. STRAUSS. Could you explain the difference between the Commission bill and the Anderson bill?

Mr. VANCE. Perhaps the most apparent difference is that the bill proposed by the Commission does not have an overall limitation on Government indemnity.

The bill introduced by Senator Anderson has a ceiling of $500 million.

Chairman CANNON. That is the greatest indemnity that can be paid in any one instance?

Mr. VANCE. That is correct, sir.

Chairman CANNON. Was that considered to be adequate?

Mr. VANCE. We think so.

Chairman CANNON. Do the contractors consider it adequate? Are they willing to go ahead if such insurance is made available?

Mr. VANCE. Now, as to the position which the Commission took on the Anderson bill, we stated to the committee at the most recent hearing on this subject that we were for either the bill which we proposed or the Anderson bill, whichever had the best chance for consideration at this session of Congress. We believed that passage of a bill at this session was the most important point to be achieved, and that, if the bill in the course of its administration developed some defects, they could be remedied later.

The point is that if insurance legislation is passed at this session there will be no delay in the forward movement of this program.

However, if the Congress does not act at this session, there probably will be some delay.

Chairman CANNON. You are proceeding then under the assumption that such legislation will be enacted at this session of Congress.

Mr. VANCE. We hope so, sir.

Chairman CANNON. You consider, in view of the urgency of this program, that a delay would be disastrous?

Mr. VANCE. Not disastrous, but it should be avoided, if possible.

Chairman CANNON. Our best interests require enactment at this session?

Mr. VANCE. Yes, sir.

Mr. STRAUSS. Mr. Chairman, might I offer this observation on the insurance aspect:

The reactors which the Government owns and which are operated for the Government at Savannah River and at Hanford are situations where the Government has the full responsibility and where there is no liability assumed by any private interests.

What we have achieved thus far in the insurance picture and which would be implemented if this bill passes this session of Congress. The present situation is that the private companies which are building and operating these reactors can obtain insurance, which they will pay for, from private insurance companies up to, I believe, $65 million in each individual instance and the Government is therefore relieved of that much initial liability.

Chairman CANNON. Will that $65 million be underwritten by a commercial company?

Mr. STRAUSS. By a group of them, sir. And there is some prospect that this amount may be increased as more companies join in the group. Futhermore, it may be increased even by those who are presently in the picture as more experience is gained and as the dimensions of their risk are reduced to reality.

Chairman CANNON. The risk includes loss of both life and property?

Mr. STRAUSS. I understand that it is general third-person liability which is included in this $65 million.

Chairman CANNON. You mentioned the Savannah River. You did not include Shippingport?

Mr. STRAUSS. I did not include Shippingport, but I might as well have done so since that is also a Government plant which will be operated by a contractor for the Government. But that is a quite small plant compared with the enormous installations at Hanford and Savannah River.

Chairman CANNON. You say the Government has undertaken by contract to indemnify the Duquesne Light Co. against atomic hazards liability and it will insure the Shippingport project in the same way.

Mr. STRAUSS. I believe that is correct.

Of course, similar guaranties or assurances or indemnifications have been given to the General Electric Co., which is the operator of Hanford and to the duPont Co., which is the operator of Savannah River. Those arrangements date in the first instance from the early 1940's and in the Savannah River instance, from the early years of this decade, I would guess about 1952.

GOVERNMENT INDEMNITY AT SHIPPINGPORT

Chairman CANNON. What is the ceiling on the Duquesne and Shippingport projects?

Mr. STRAUSS. As for the Government's assuming liability, I don't believe there is any ceiling at all, sir.

Chairman CANNON. The sky is the limit?

Mr. STRAUSS. The Government, at the time when these things were entered into, took the entire risk. Otherwise the contractors could not have been obtained to operate the plants.

EXTENT OF INSURANCE PROBLEM

Chairman CANNON. If you have to go that far in order to secure the erection of this first project, how far will you have to go to secure the rest of the program?

Mr. STRAUSS. Obviously in each case $65 million less coverage will be required. That is to say, the first $65 million will be borne by private industry instead of by the Government.

Chairman CANNON. You think that will be done?

Mr. STRAUSS. I believe so, sir. The Commission is proceeding on that assumption.

Mr. RABAUT. Is that $65 million a part to be deducted from the $500 million which was proposed in the Senate bill, or the Senate study?

Mr. STRAUSS. I am not familiar with the details of the Senate bill.

Mr. RABAUT. Or is the total $565 million?

Mr. STRAUSS. In other words, the first $65 million is borne by private industry.

The second $500 million, if any, above that, is borne by the Government.

CHICAGO NUCLEAR PLANT OF COMMONWEALTH EDISON

Chairman CANNON. I note a statement by Mr. Gale, chairman of Commonwealth Edison. Commonwealth Edison is proposing to construct which of these reactors?

Mr. STRAUSS. That is known as the Dresden-Illinois power group. I don't recognize that name of the individual.

Chairman CANNON. He is the chairman of the board. Here is what he says:

> The granting of a permit, however, will still leave one major obstacle in the path for the construction of the plant. I am referring to the problem of insurance. What we are really concerned about is the extraordinary third-party liability from a major nuclear catastrophy.

This is somebody entirely outside the contracting parties.

Then he says:

> We do not at this time see any sound basis on which we can risk our solvency on the possibility, as remote as it be, of a major nuclear catastrophe.

Then he goes on:

> Before I conclude I should point out that everything I have said applies equally to the builder of the nuclear plant, in our case the General Electric Co. and its subcontractors.

What are you doing in a situation like that?

Mr. RABAUT. Who is that letter by?

Chairman CANNON. The chairman of the board of Commonwealth Edison.

Mr. STRAUSS. That, Mr. Chairman, is I believe, the same position that was taken by the General Electric Co. when, during the war, they were asked to operate Hanford.

The same situation that was taken by the du Pont Co. when, in the postwar period, they built Savannah River for the Government and we asked them to operate it.

It seems to me that it is a perfectly logical and proper position for them to take, and I believe it is the position which any of us as

directors of such a company would be in good conscience compelled to adopt in discharge of trust that we would have as directors.

Chairman CANNON. Well, he makes the flat statement. It is a very simple statement, but quite emphatic. He says:

We will not risk our solvency on the possibility, remote as it may be, of a major nuclear catastrophe.

Now, that is the end of it, as far as he is concerned.

SAFETY IS A MAJOR PROBLEM

And again here is another instance in which Mr. Francis McCune, who is the vice president of General Electric Co., said last March:

We then say it is impossible, and that happens to be a very safe type of reactor, but it was impossible for the *Titanic* to sink, people thought.

Senator Pastore then said:

Mr. McCune, you say unless an answer is found to the insurance problem that is the one big obstacle that might retard the progress we all desire in the development of the atom for power production.

And Mr. McCune left no doubt at all about his position.

I believe exactly what you say.

Mr. STRAUSS. I believe the issue is that, assuming that we have atomic power developed, whether the Government has all the responsibility or the responsibility less $65 million worth for each plant. It is as simple as that. There is no debate.

Everyone I know who is competent on this question agrees that this issue will have to be resolved in one way or the other before there is a large development of atomic power in the United States.

Chairman CANNON. If we must assume all of the responsibility, why not construct these ourselves.

Mr. STRAUSS. There are a number of reasons why we should not do that. I think they would be very much more expensive to construct if the Government undertakes to do the job, because then the contracts will have to be let on a cost-plus or fixed-fee basis.

Mr. RABAUT. What relationship would the expense be, if something goes wrong? I say, what relation would this expense be, this extra expense we would be put to, if something went wrong?

Here we have all the responsibility.

Mr. STRAUSS. No; you have all the responsibility today with respect to Savannah River and Hanford.

Mr. RABAUT. We have $65 million, but here you see every contractor is sounding off, saying, "We can't take a chance of going insolvent by going into this game with you."

Mr. STRAUSS. Each of them can buy $65 million worth of insurance.

Mr. RABAUT. The point is, what would be the expense if we were to do it ourselves in relation to the expense that might be incurred if something goes wrong and we have these other people doing part of it for us, but we take all the responsibility?

Sixty-five million dollars is a large sum of money, but in this picture it is not a large sum of money.

Mr. STRAUSS. Some think it is.

Mr. RABAUT. Sure; the fellow paying it thinks it is, but the load that is going to be on the Federal Government is way out of proportion to it.

Mr. STRAUSS. The converse of that is that the full load is on the Federal Government.

Mr. RABAUT. That is what I say, that the full load is on the Federal Government; let us admit it.

Then, if the full load is on the Federal Government, why should not the Federal Government take the whole load and do the job itself and then it will be responsible for its own actions?

Here, if something happens with one of these other plants, the actions are not completely within our control.

Mr. STRAUSS. The actions will never be completely within your control.

Mr. TABER. Can the gentleman not have an opportunity to answer one question before he gets another?

Chairman CANNON. What I was asking to include is merely a part of the gentleman's question.

Mr. STRAUSS. I was simply going to point out something which I feel must be apparent to you.

In the face of these activities, does the Government operate anything? Everyone of our operations that I know of—there may be some quite small subsidiary sampling or testing activities in New York that are operated directly by the Commission—everything else is operated by a contractor, a university or industrial contractor.

The liability, therefore, or the ability to control the operation, is always one step removed from the Government. I think the fact is important that we have had no trouble and had no accidents and that the safety record is quite phenomenal. We have received safety awards year after year, and our accident record is about as low as anything in industry. All these facts should afford some degree of satisfaction that we continue to operate in that way.

INSURANCE IS A MAJOR PROBLEM

Mr. RABAUT. It is not that we are questioning the safety record or anything. What we are astounded with is this insurance business. This insurance business is quite a shock to every member of this committee. This is a lot of money.

All the instances, there is $500 million involved?

Mr. STRAUSS. Look at what you are insuring today. You are insuring the Hanford piles and the Savannah River piles at 100 percent of liability. There is no $500 million ceiling for them.

You have been on that hook for 11 years, longer than that; you have been on that hook for 14 years.

Mr. RABAUT. That is true, but they are not located in Detroit; they are not located in Chicago; they are not located in New York, or located in Oakland.

Now, these plants we are talking about are where damage could be done and we could lose probably all the money we have invested if something happened, that is true. That is a chance that we took.

But now we are going into new fields. The question is: Should we make this investment in these new fields? Should we take all this responsibility in these new fields?

I appreciate industry's interest in it, but this is a big surprise and you are in each one of these deals for $500 million if something there goes wrong.

Just because we arbitrarily set a ceiling, is that going to be a ceiling? We do not know.

Mr. STRAUSS. It will be a ceiling to which the Federal Government is liable. I think this is a very proper moment for you to pause and consider, if this is the expense of atomic power, whether you want it.

We have explosive plants located close to centers. Lake Denmark, which is an orthodox explosive plant, blew up a number of years ago, and did a great deal of damage. The Hanford reactors are within a few miles of Richland.

The Savannah River reactors are within 35 or 30 miles of Augusta, and other centers. These problems were all carefully considered by the Commission of that day and by the Joint Committee before the reactors were installed, with the exception of Hanford. The initial installations at Hanford were made before the atomic energy program was a civilian enterprise.

Selection of the Hanford site was done by the Corps of Engineers. We have used the Corps of Engineers each time subsequently to decide on the most desirable location of these plants.

Mr. PHILLIPS. It seems to me that the question is simply: We have had these explosions; we had them in Texas City. We had them in Chicago. We cannot prevent accidents. We are up against a new development which up to date has had no period of experience.

Now, if we build them ourselves, we have a 100-percent liability. We presume we may be going to build 50 of these.

If we have even partial coverage by a private company we have saved ourselves a portion of the liability.

It seems to me the argument is all in favor of carrying on this other program. But I ask this question, too, and I ask this of Admiral Strauss:

We seem to think that the only people who are concerned with liability are private electrical companies, like Commonwealth Edison and so forth. But consider one of these many cooperatives that would like to get into the field of nuclear power you do think they are going to do all this without some assurance of liability protection and in that case we would again carry the entire liability.

Mr. STRAUSS. I would imagine that the State authorities will require from every constructor and operator of a reactor, whether private or cooperative, the same degree of protection for third parties. To do otherwise would be unreasonable.

Chairman CANNON. I think the gentleman from California, Mr. Phillips, touches on a very important phase of it.

These reactors should be of a size that will permit construction by a number of contractors.

But there seems to be remarkable unanimity on the part of all who are asking contracts, as to the danger involved and in their refusal to assume any part of the risk.

For example, here is the Yankee Atomic Electric Co. The representative of that company makes this statement:

While the possibility of such a catastrophe is remote—

and all of them emphasize that point, remote—

While the possibility of such a catastrophe is remote, it cannot be said to be negligible so long as human error is the factor to be considered in the construction of a reactor.

The spokesman for the Nebraska Consumers Public Power District, to whom you have assigned the sodium graphite reactor, makes this statement:

Before the end of 1956 we expect to be making firm commitments for equipment not only for the reactor portion of the powerplant, but for the conventional portion as well. Such commitments, however, cannot be made until it is definitely known how much insurance will be available on the plant and at what cost. Otherwise, we might find ourselves with an atomic powerplant involving millions of dollars in construction cost ready for operation, but that operation is impossible or impractical because of insurance limitations.

Now, I would like to ask the chairman if the Commission is unanimous in the belief that the Government should not construct any of these, but that the Government should assume all liability.

Mr. STRAUSS. No, sir; I don't think the Commission is unanimous on this point.

Chairman CANNON. Let me ask Commissioner Murray to give us some statement on this question.

INSURANCE PROBLEM MUST BE SOLVED

Mr. STRAUSS. I believe the Commission is unanimous, Mr. Chairman, on the need for insurance. I don't think there is any question about that. I think there is not unanimity on the question of whether or not the Government should construct plants.

Chairman CANNON. Now, if you are proposing the construction of these huge plants only, there are few who have capital to stand that expense and provide the operating personnel.

But if you would construct for each of these systems a smaller experimental plant which would give you the information you want, then there would be many who would be in position to participate in the program.

Mr. Murray, what would you say of that proposition?

Mr. THOMAS E. MURRAY. Speaking generally of the insurance problem, that is a problem that the Commission unanimously has faced for a long while. The insurance problem has been there. We decided it was important to get on with the development of atomic energy.

Once you make that decision, then everything else falls in place. The question of insurance, as you pointed out here, looms very large in the mind of many of these companies or all of these companies which are going to build reactors.

We cannot expect private industry to move into this field, into a brand new field, without giving them some assurance against this kind of catastrophe.

My personal idea on insurance, as far as our power demonstration program is concerned, is that there should be no limit to the Government's backing up private industry in the insurance field.

Now, I think you have to assume that if you are going to move forward and there is a roadblock that we see ahead of us then this roadblock must be removed.

We made up our minds that we were going to go ahead with this power demonstration program. Back in all of our minds was the fact that this insurance problem would loom large. I was hopeful—and I think we have made very good progress with the insurance companies—that there might be some portion of this insurance that private industry would assume.

As the chairman has indicated, they have stated now that they will assume about $65 million. Whatever that top limit is, I think it is the function of the Government, as long as it has made up its mind that it wants to get the answer to this nuclear power problem, to brush the problem aside and assume that risk.

It is not a permanent step that the Government takes. It could be limited to what is now known as the power demonstration program. We have 5 or 6 different types which we should explore.

I can envision that we can limit our insurance to that particular power demonstration program and not, as Mr. Phillips has indicated, make an insurance law that would cover 50 or 100 reactors for the next 15 or 20 years.

That is something to be faced in the future. As the private insurance companies get into the business, they learn a little more about it and they will be willing to take larger risks.

Chairman CANNON. There is general consensus of opinion, then, on both sides of the table and in both industry and government, that the risk is of such a nature and of such volume that it can be handled only by the Government.

Mr. THOMAS E. MURRAY. I feel that way.

Chairman CANNON. Mr. Rabaut suggests that the cost of these reactors should be reduced to the point where the general public can be invited to come in and participate in a program of moderate proportions instead of leaving it to a few giants who can mobilize large amounts of capital.

Mr. THOMAS E. MURRAY. I think fundamentally that we have under way now what we call a power demonstration program that has been assigned and allocated to various sections of industry.

I think we should remove all the roadblocks, particularly of insurance, which are in the way of getting on with private industry. We should let them come in and do the best job they can.

NECESSITY FOR GOVERNMENT CONSTRUCTION OF NUCLEAR POWERPLANTS

I do not know whether you realize it or not, but I am anxious that that particular program be supplemented by some governmental building of some of these large reactors.

Chairman CANNON. You think the Government should collaborate by supplying capital for certain phases of the project?

Mr. THOMAS E. MURRAY. Once you make up your mind, Mr. Chairman, that atomic energy is something of vital importance, once you make up your mind——

Chairman CANNON. It would be very difficult to imagine anything of more importance at this time.

Mr. THOMAS E. MURRAY. If you do and you make the determination that there is urgency involved, then you take other steps in conjunction with the work that is now being done by these various private companies.

This insurance problem, I hope, will be solved in such a way that we can assure these companies that they will be adequately protected. Now, they are not going to build these reactors without our approving their design, without our Reactor Safeguard Committee saying that we think the design is safe.

They are not going to be allowed to go out on their own and build any kind of reactor, disregarding safeguards.

The Commission does have the responsibility and does play a part in it.

PROBLEM OF INSURANCE

Mr. RILEY. On this insurance setup that you have, do I understand that the private companies will assume the primary liability up to $65 million, and the Government's insurance will be in the nature of excess insurance: is that right?

Mr. STRAUSS. That is right.

Mr. RILEY. The private companies will stand the first liability and pay the first losses?

Mr. STRAUSS. That is right.

Mr. RILEY. The possibility is that the Government insurance will never be used?

Mr. STRAUSS. That is right. My own beliefs are that the chances are extremely remote that any of it will be used, but it is prudent to have it.

Mr. RILEY. Of course, the private companies will take care of their own premiums and costs. Do you propose that these private companies will pay some type of premium into the Government for this excess insurance?

Mr. VANCE. The bill provides for a nominal premium.

Mr. STRAUSS. Our bill did, and I am glad the other one does.

RECOMMENDATIONS OF COMMISSIONER MURRAY

Chairman CANNON. Before we take that up, may I ask Mr. Murray a question.

Mr. Murray, I note in testifying before the Joint Committee recently you made this statement:

A properly broad view of our security interest as well as a true sense of our bounden duty to the people of the world urges us to discharge one of these vital responsibilities by launching in a vigorous power-reactor program that will be adequate in scope to the demands of the situation that faces us.

I think all of us can go along with you that far. I think that there would be general agreement on that statement.

Then you go on to say:

These are my recommendations—

apparently in order to secure that result—

these are my recommendations, first, that we adopt and adhere to a policy which recognizes that the establishment of a commanding lead in the atomic power race is a matter of urgent importance to the United States.

I still think we can go along with you on that.

Mr. THOMAS E. MURRAY. Once you buy that, then all these other things drop into place, but you must buy that first proposal.

Chairman CANNON (reading):

> Second, that, as the first phase of a program to implement this policy, we plan to install at home and abroad, between now and 1960; it includes power reactors capable of generating 2 million kilowatts. Also that we further establish as the goal of the second phase of our reactor program 10 million kilowatts to be installed at home and abroad between 1960 and 1965.
>
> Third, that primary responsibility for financing the first phase of this program be assumed by the Government and that the manner of financing the second phase be left for later decision.
>
> Fourth and last, that the Commission continue its present effort under the power demonstration program.

Have you changed your mind on that?

Mr. THOMAS E. MURRAY. Not a bit. That last recommendation is just what I have been pointing out now in relation to insurance, that the Commission continue to back up to the limit the work that is being done now in the power demonstration field; yes, sir.

If that means giving them insurance, getting them new insurance laws for the next year or a couple of years to protect those 4 or 5 experimental reactors, I think we must do it.

Chairman CANNON. What about the third proposition, that primary responsibility for financing the first phase of this program be assumed by the Government?

Mr. THOMAS E. MURRAY. I have three pages here that I was wondering if I could read into the record because it has a relationship.

Chairman CANNON. Will you read that to us? You were not with us when we met last time. We have had no opportunity to secure a general statement from you. Can you give us that statement now?

Mr. THOMAS E. MURRAY. All right, Mr. Chairman.

On February 23, 1956, in a statement you were just quoting, I proposed to the Joint Committee on Atomic Energy that the country adopt a national policy which treats the development of an industrial atomic power as a matter of urgency.

I was impelled to make this proposal by the ever-increasing threat of nuclear weapons to the continued existence of mankind.

And so the remarks that I express here today on budgetary requirements should be considered in the light of the national policy I proposed.

My proposal to the Joint Committee on Atomic Energy last week was that the Government undertake a program of large reactor construction that would carry out this policy. Specifically, this program provides for the construction of five large-scale reactors of the following types: (1) the pressurized water reactor of advanced design; (2) the homogeneous reactor; (3) a natural uranium reactor; (4) a sodium graphite reactor; (5) a gas-cooled reactor.

The preliminary estimates are that such a program would cost approximately $365 million; of this total approximately $190 million would have to be obligated in the fiscal year 1957 for construction and would be expended over the next 4 years.

In addition, approximately $30 million would be required for research and development during fiscal year 1957.

Your committee recognizes that the budget before you in no way attempts to carry out these large reactor proposals. In fact, there

is question whether the budget before you is adequate to meet the limited objectives of the Commission's current program.

For example, in the original 1957 budget as prepared and submitted, there were no funds provided for new reactor construction. The figure for research and development was $38 million, and the figure for construction was zero.

Subsequently, in the latter part of April the staff concluded that its earlier request for civilian reactor funds should be supplemented. The staff gave four reasons as to why it thought this increase was necessary. These were their four reasons:

First, the size of the task proved larger than anticipated.

Second, the timing and extent to which industry can be expected to participate financially will be later and probably less than anticipated.

Third, information regarding programs of other nations furnished stronger incentives for accelerating our own program.

Fourth, the staff had acquired better appreciation than they originally had of the requirements of the countries we intend to help, indicating the need for increased attention to certain specific power reactor characteristics.

Now, whatever the reasons, the Commission approved the submission of a supplemental budget requesting additional funds as recommended by the staff.

The amounts were as follows:

For research and development, $55 million;

For construction, $35 million.

In the budget before you today these amounts are reduced to the following:

Research and development, $15 million;

Construction, $15 million.

In other words, this budget is $60 million less than that which the staff considered necessary last April.

It appears to me that we are backing off instead of moving forward with the kind of civilian reactor program this country should adopt.

Now, to sum that up and in line with those four suggestions I made last February, I personally am convinced that the problems are so enormous for private industry today to go ahead with getting on the job and building these various types of reactor, that it will be a long time before any of these reactors come into existence.

What is the trouble with that? I have no trouble with that, if there is no urgency involved. I think our power demonstration program is a splendid program provided we have lots of time and that we can give private industry time to get familiar with the various phases of reactor development and to carry on their experiments in an ordinary fashion.

What we are now doing is perfectly sound, perfectly usual, outside of the question of this insurance problem.

But if you could only consider this whole reactor program in the light of the weapons threat to the world, and the threat of world destruction, then I think you get an altogether different picture of what ought to be done, what must be done in the peacetime applications of atomic energy.

My proposals just boil down to that. Our Commission is so close to what is happening in the weapons field, in the field of destruction, that we must be aware of the urgency. I was out at Eniwetok during the last couple of weeks and that experience just reemphasizes and brings back to my mind the urgency to get something going on peaceful applications.

I do not like to belabor the subject, but the question of insurance, who carries the insurance, whether the Government is going to carry it, or not, I kind of blow that to one side.

It may be a big obligation, but once you realize, I say, the threat to humanity and what this whole atomic energy program means to the world, and what problems we have to face in the future, and the promises we have made to make the atom available to the whole world, to all humanity, you may see the necessity of taking some action.

Now, I said goals. I say let us have 2 million kilowatts by 1960. Where did you get that figure 2 million kilowatts? Well, out of the top of my head. What is a practical thing? What could you do?

We get objections to that proposal on the basis that it would interfere with a lot of other programs; it would interfere with military programs; it might interfere with production of weapons, and things of that sort; but you should not look at it in the framework of what our organization is today.

You must look at it on the basis of setting up a national policy, to get on with the job.

Now, I will just divert here for a moment. The question of economics is always thrown out on the table. They always say, "If the Government builds that, we are going to be hooked with some bum reactors for the next 20 years; they are going to be uneconomical and we will have to support them."

I ask the question: Is private industry ready to do that? Private industry has no more knowledge and technicians available than we have.

So when they build a boiling reactor, or when they build a homogeneous reactor, they are going to follow the techniques that we have lead out so that the reactor that they have built is going to be an uneconomical reactor.

Why should private industry move into a field which they know from the very beginning is uneconomical?

I say that they have other interests to protect and private industry has a lot of very valuable assets that must be protected.

I, for one, from the very beginning, have tried to encourage private industry to come into this program. Private industry must be protected. With all due respect to your statement this morning, Mr. Chairman, when you said that the Government has spent $15 billion for the development of atomic energy and, therefore, it ought to be given out to the public and made available to the public, there are some questions on how that should be done; whether you are going to do it through private enterprise; or whether you are going to do it through governmental operations.

The question of getting on with this job, and being sure that on certain dates that you are going to have so much power and so many reactors—that is the problem.

One of my suggestions last week was to try to avoid the issue of private versus public power; that we try to sidestep that issue by

placing these reactors at our production centers so that there is no question of distribution.

At these centers we use about 7 million kilowatts of electric energy. We could put a 150,000 kilowatt homogeneous reactor at Oak Ridge and let it float on the line and have no difficulty.

We could put one at Hanford; we could put one at Savannah River. We could put one at Portsmouth, or Paducah, so you get this whole development of reactor technique out of politics.

And try to get on with the job. And there is a big job ahead of us, a tremendous job.

Even with the PWR which everybody says is in the bag, there are tremendous problems in the PWR which must be solved before we get moving.

So that anything that this committee can do to facilitate and remove the roadblocks would be of great advantage to us.

The PWR is the Shippingport reactor. We are building it and we will have it next year. It will be a very expensive operation at the start. Costs will be cut as we put in new cores. One of my suggestions is that we build an improved PWR.

I, for a moment, would like to explain why that suggestion comes to my mind.

For instance, the PWR will start operating, we will say, in 1957 or 1958. You will not be able to put a new core in that reactor maybe until 1959.

In other words, you wouldn't be able to try some new techniques and cores until that particular time.

So I think we could well afford, with all the technology we have learned, to go ahead and build another one of these PWR's.

There might be an argument later that that is not the right type. Whatever program I suggest, I do not want it to be understood that it is ironclad, that you have to have 2 million kilowatts and you have to have it January 1, 1960.

But I am trying to focus attention on the problems, the great world problems that you face in this particular business. I am interested, but I am not taking into consideration whether the Russians are ahead of us or whether we are ahead of the United Kingdom or whether they are doing this.

We should do the job unilaterally. We should make up our minds to go ahead and build these reactors and get on. It is only by building and operating reactors that you will learn the techniques of reactors. It is absolutely the only way. You will develop manpower at the same time; you will develop all the other adjuncts that go with it.

In doing that, you will be developing all the auxiliaries that go with it, the people for fabricating fuel elements and the processing of fuel elements. All of these things will follow, the more reactors that we have made.

Now, we have to approach this problem. The word "crash" is always used. Will this be a crash program? No, no crash program, as far as I am concerned, but you have to establish a completely new organization within the AEC to take this job over. The AEC staff for reactor development is doing a marvelous job, but this is a tremendous job in itself.

It is another Manhattan District job in a general way. The responsibility should be placed somewhere, and in building these big reactors you are not going to interfere with private industry.

Private industry is going to be the great benefactor from such a program. They are going to move ahead with more courage and more confidence.

Chairman CANNON. Mr. Rabaut.

Mr. RABAUT. Do I take from your statement that you feel that as far as we have moved along with private industry, those reactors should continue to be developed?

Mr. THOMAS E. MURRAY. By all means.

Mr. RABAUT. And that program should be kept and that we should enter into some sort of insurance for that program?

Mr. THOMAS E. MURRAY. We should give them even more encouragement, including more money in our budgets to help that particular program along; yes.

Mr. RABAUT. What about the further development of the program? Do you figure then that the Government should do the balance of the program after that or do you think that should be still further continued with private industry now?

Mr. THOMAS E. MURRAY. I think for the next 3 or 4 years that the Government must move into those various areas I have indicated. As I say, they are just indications of general types of reactors which might be built.

The large-scale reactors, to my way of thinking, will not be built and will not come into existence until the Government moves in. That is, within the reasonably near future. I would like to repeat again, if there is lots of time, there is no hurry——

Mr. RABAUT. You feel it would accelerate the program?

Mr. THOMAS E. MURRAY. It would accelerate the program, but it would require several hundred million dollars to do it, and it would mean bringing in new types of contractors. It would mean bringing in new facilities and all those sort of things that go with it, and you do not know what you can do.

It is all right to sit down here and say, "I don't think I can do it," or "I think I can do it." You don't know what you can do until you actually get the authority to go ahead.

INTEREST OF PRIVATE UTILITIES

Chairman CANNON. In that connection, Mr. Murray, let me ask you: Here are a couple of quotations; one is taken from the Wall Street Journal.

> Officials of the companies which make reactors say frankly that most of their utility company customers have no early expectation of cutting costs by building atom plants; their primary motive is to stake this out as an area of private rather than public power.

Mr. THOMAS E. MURRAY. I would not want to endorse that statement as a whole. I believe that the private utility companies of this country have a great interest in the development of atomic power. It is the first time, however, in the history of this country that private utility companies as private utility companies have gone into the construction business.

Mr. TABER. You mean the experiment business?

Mr. THOMAS E. MURRAY. Yes. For instance, ordinarily you would go to General Electric and you would go to Westinghouse and say, "Mister, build me a 100,000-kilowatt atomic energy plant." General Electric would sit down and say, "Here is the cost figure. We will get going."

But there is no information available which assures General Electric, Westinghouse, or any of these people, what these costs are going to be. Naturally, private industry cannot jump in with both feet and spend millions of dollars to go off on a half-cocked idea which somebody might have and which we might decide it is a good thing to do.

Chairman CANNON. The alternative of that is for the Federal Government to go as far as practical so that private industry later on can take it up and develop it.

Mr. THOMAS E. MURRAY. Absolutely.

Could I just interrupt a minute? If private industry develops reactors, and if the Government makes up its mind it wants to use atomic reactors, there is no reason why the Government tomorrow or the next day cannot go into the atomic energy business.

The overemphasis is being put here on who develops the thing. If the Government develops it, do you then foreclose private industry from this business? You don't.

Or if private industry develops it, do you foreclose the Government from going into the reactor business? You don't. It works both ways.

Chairman CANNON. Here is a statement of similar import taken from Fortune magazine this last August in which it says:

> Utility executives * * * are not motivated solely by an urge to bring cheap nuclear power to the world.

Of course, that would be an objective of the Government in such enterprise, to bring cheap nuclear power to the world as soon as possible.

> Utility executives * * * are not motivated solely by an urge to bring cheap nuclear power to the world. One of their chief reasons for acting, perhaps the most important one, is referred to only guardedly. The utility industry is mortally afraid of public power.

Mr. THOMAS E. MURRAY. Well, that is a fear and it is a justifiable fear.

Chairman CANNON. You say it is a justifiable fear.

Mr. THOMAS E. MURRAY. I mean, it is a fear that could be in somebody's mind. I have been brought up in the private-power industry. I do not share that fear. I can recognize that it may be a fear and that they are afraid that there is going to be another TVA.

Oh, referring to your statement, Mr. Chairman, with all due respect to you this morning, again, that the Government——

Chairman CANNON. I am glad to have it criticized.

Mr. THOMAS E. MURRAY. That the Government has spent $15 billion and therefore the taxpayers are entitled to get some dividend on that $15 billion, I think private industry can give them the dividend on that $15 billion.

Chairman CANNON. I will complete the statement from the Fortune magazine.

The utility industry is mortally afraid of public power. "You know what happens," says one of the industry's leaders, "if you leave a vacuum, something will fill it. We don't propose to leave an atomic power vacuum."

RUSSIA AND BRITAIN

You see, that is the significant statement. Now, I was much interested in what you said to the effect that it is not so important whether we are in a race with Russia or in a race with the United Kingdom.

Mr. THOMAS E. MURRAY. We may well be.

Chairman CANNON. But from statements made here and the statement which the clerk read to the committee before you came in, we are told that Russia has already had one of these reactors in operation for some time, and that Russia, to that extent, apparently is leading us. Would you say that is true?

Mr. THOMAS E. MURRAY. I do not believe anything about Russia that I read, ordinarily, in the paper.

What they are doing in the power program is a matter of conjecture, but nobody can doubt the fact that they have the ability to get into this power program and do the things that we are claiming they intend to do, because of their scinetific manpower.

Chairman CANNON. Don't you think, Mr. Murray, if Russia should outstrip us and take a commanding lead in this field, that it would be fraught with dire consequences to us and the rest of the world?

Mr. THOMAS E. MURRAY. I think the loss of prestige would be terrible to the United States, but it would be a mistake to base your program on such a statement as "Murray wants 2 million kolowatts because the Russians want 2 million kilowatts," or "Chairman Strauss wants so-and-so because the Russians do." If you start basing your programs and your whole philosophy and your approach to this subject on what the other fellow is doing, you are liable to be misled; you are liable to make a lot of errors.

Chairman CANNON. That should not blind us to the fact that Russia is in a race with us, both in the development of military weapons, as well as commercial power.

Mr. THOMAS E. MURRAY. I think we can agree on that.

Chairman CANNON. And it is a matter of such urgency that we have no time to lose if we are to maintain our position.

Mr. THOMAS E. MURRAY. I think you could base your argument more on the basis of what our promises are to the rest of the world to bring atomic power to the rest of the world.

INSURANCE IS A PROBLEM

Mr. JENSEN. I have been much interested in your statement, Mr. Murray. You have brought out a lot of things that are very important to this question.

The first one being the insurance which private insurance companies are willing to contribute in the way of a $65-million guaranty or insurance policy on these plants. Now, as I understand it, they are willing to go to that extent of insuring up to $65 million, and then whatever that amount does not take care of, in case of a catastrophe, that the Government will pay up to $500 million.

Mr. THOMAS E. MURRAY. In addition.

Mr. JENSEN. Now, I think the private insurance companies should be complimented for that offer.

Mr. THOMAS E. MURRAY. I agree with you.

Mr. JENSEN. After all, the private insurance companies are no different from you or me. When we have an investment in anything we take a greater interest in it, whether it is the horse race we bet $2 on, or whether it be a business enterprise, or whatnot, or whether it be a political campaign.

If one contributes $5 to a party, they have more interest in it. So it is with any business. So I think it is well to accept that offer by the insurance companies who have grouped together and pledged their interest in this program.

Also, I think it is well to have private business take a very active part in this program, as well as all other programs in which the Government has a particular interest and responsibility.

ROLE OF PRIVATE ENTERPRISE

Now, as the chairman has just read, that some private power officials said if the void was left in the atomic energy field, private industry would fill that void. Now, that is a very commendable statement. I do not know that anyone criticized it, even the chairman, because certainly our system of Government, which is based on private enterprise, private initiative, has made us the greatest Nation in the world.

Now, sometimes they have failed in going the full way, but it has been good up to date, with all of the faults of our form of Government it has been good. So I hope that we can encourage private industry to shoulder their fair share not only of the financial, but also of the scientific responsibility that should fall on their shoulders, because they have a lot of good scientists and mathematicians that are not working for the Government and they are busily at work trying to encourage and to develop these new sciences, such as atomic energy and certainly we don't want to throw any stones in the road.

NEBRASKA PROPOSAL FOR NUCLEAR POWERPLANT

Now, leaving that matter, you said a minute ago that you believe we should place these atomic reactors in close proximity, I believe you said, with the atomic energy plants, and I can agree with that. I cannot quite understand why you have made a suggestion, possibly even going to the point where the Commission has pledged itself to build atomic energy reactors in the State of Nebraska.

You know, of course, the State of Nebraska is purely a public-power State and they pay not 1 dime of Federal tax on power revenue. To spend $60 million or $70 million of the taxpayers money in building a graphite reactor in that State, does not square with common sense or fairness to the people of other States that do pay a Federal tax on their power revenues.

I was wondering why the State of Nebraska was even thought about for a place to build one of these power reactors.

Mr. THOMAS E. MURRAY. Well, Consumers Public Power District of Nebraska have been interested for maybe a year or more in getting

a sodium graphite reactor placed in their State. They made arrangements with North American Aviation, Inc., to carry on such a project. Here is the exception that I make to placing these reactors at our production sites, because of this background and because of the work that was done by the State of Nebraska and Consumers Power.

Mr. JENSEN. Just a minute, now. Then do I understand that the taxpayers of America will have no dollar investment in the proposed graphite reactor plant in Nebraska?

Mr. THOMAS E. MURRAY. It would under my plan. It would be similar to what we call the Shippingport reactor.

Mr. JENSEN. Under your plan——

Mr. THOMAS E. MURRAY. In order to get ahead, to get a large sodium graphite reactor built, I believe that we must step in. If we want it in the near future, if we want it in the next 3 or 4 years, we must step in and do something in that particular area.

Mr. JENSEN. In what area?

Mr. THOMAS E. MURRAY. In the sodium graphite reactor area.

Mr. JENSEN. Does it necessarily have to be in a State that has cheated the Federal Government of the taxes? Mr. Flash Myers, who promoted that program out there, said to the people, "Why spend all this money paying Federal taxes? Why not keep it, go into a public-power State, and then the State of Nebraska will have all the money and more than they need to build powerplants, distribution lines, and everything else, and your wives will have enough left over to buy a nice fur coat."

I am asking why the taxpayers of every other State should be required to pay for any part of the power-producing and distribution system of the State of Nebraska where no Federal tax is paid on electric power?

Mr. THOMAS E. MURRAY. Well, you raise a problem, and you raise a question—all of these questions have not occurred to me as you raise them.

I have thought of this particular location, but here is what I said about this particular job, because of this presently negotiated contract between North American and Consumers Power. All with the idea of trying to get ahead in the sodium graphite field, I said, "Construction of a large-scale"——

Mr. JENSEN. I certainly want to be the last one to stop any progress in the atomic-energy field. I want you to know that. I will be the first one to be of assistance to you in any program that will get this job on the road and on the road fast.

Mr. THOMAS E. MURRAY. Well, this sodium graphite reactor does not necessarily have to be placed in the State of Nebraska, but I gave you the background of why it occurred to me that this might be a method of carrying it out and giving it a pattern similar to the Duquesne Light Co. in Pennsylvania.

Mr. JENSEN. Then nothing has been decided yet as to where——

Mr. THOMAS E. MURRAY. None of these things have been decided. These are all on paper.

I will just read this on the Nebraska situation.

Construction of a large-scale sodium-graphite reactor in the near future presents a difficult problem. To solve it, I propose an approach that differs in detail but not in principle.

Concretely, I would have the Government assume the responsibility for building a large-scale reactor of this type. It could be located in Nebraska and the power made available to the Consumers Public Power District.

North American Aviation would continue to develop and construct the plant. Such a plant would permit research and development to be stepped up from its present inadequate level.

This is the only way that I can see to bring this reactor into operation at an early date.

Mr. JENSEN. Thank you.

Chairman CANNON. Without objection, the committee stands adjourned until 10 o'clock tomorrow morning.

TUESDAY, JUNE 26, 1956.

INSURANCE PROBLEM

Chairman CANNON. The committee will be in order. We will resume the hearing where we left off last evening.

Mr. Rabaut.

Mr. RABAUT. Mr. Chairman, I thought for the purpose of the record, following the remarks of the gentleman from Iowa last night, that it might be inferred that someone here had said something derogatory in regard to the insurance companies. We have no intention at any time during the consideration of this matter to say anything critical of the insurance companies because anyone here could well recognize the fact that this is a new matter with them, and there is no former experience or yardstick of measurement by which they can be guided. We all recognize that situation: so there is no desire to involve the insurance companies at all in the matter. Whether they will be involved, of course, if policies are taken out as were spoken of yesterday, or whether the Government will stay on its own with it, that remains to be decided. That is what I wanted to say this morning, Mr. Chairman, for the purpose of the record.

Mr. STRAUSS. Mr. Chairman, may I comment on that?

Chairman CANNON. If you will.

Mr. STRAUSS. I would like to say simply that as a listener on the other side of the table, I did not infer that any member of the committee was critical of the insurance companies. I listened carefully to the colloquy. I don't believe any of us carried any such impression away.

Mr. JENSEN. Mr. Chairman, may I say in reply to Mr. Rabaut that I certainly did not intend that what I had said would put any onus on any member of the committee. I simply said that I thought if the insurance companies were willing to take the risk of $65 million, that they should do it and should be privileged to do it. Certainly it was not my intention to criticize any member of the committee for his position on insurance companies in this instance. Certainly I didn't mean it that way at all.

UNANIMITY OF OPINIONS OF THE COMMISSION

Chairman CANNON. You may continue, Admiral Strauss.

Mr. STRAUSS. In the same context, Mr. Chairman, yesterday you addressed a question to me on the subject of unanimity. You asked, as I recall, whether the Commission was unanimous in its attitude with respect to the necessity of insurance indemnification for third party liability, and I said I believed that the Commission was. Subsequently, in the course of his informal statement to you, my colleague, Mr. Murray, confirmed that. But as his statement progressed it became apparent that there was a difference between us with which I had not been familiar and as I said, Mr. Murray, it was to the effect that he would limit the insurance provision to those companies and cooperatives in the power demonstration reactor program.

In the bill which we proposed, and in the bill which has been introduced by Senator Anderson, that limitation does not appear. It would be my feeling—I have not had an opportunity to discuss this with Dr. Libby and Mr. Vance and, of course, not with Dr. von Neumann, who is ill—that such a limitation would quite seriously hamper the development of atomic power in the United States, and therefore, I think, with that reservation we are unanimous, but not on that point.

There is, however, a rather more fundamental difference between the Commissioners from the point of view of unanimity which was brought out yesterday, and I would like to comment on it, with your permission, quite briefly.

DIFFERENCE IN PHILOSOPHY OF 1946 AND 1954 ACTS

The statute under which we operate—the Atomic Energy Act of 1954—was enacted by a so-called Republican Congress, and the statute under which we previously operated—the McMahon Act of 1946—was enacted by a so-called Democratic Congress. There are a large number of common denominators in those laws.

The first one, and the most obvious one, occurs in the opening paragraph of both statutes where, after being enjoined to do everything possible for the common defense and security, the Commission is directed to encourage to its utmost free competition and private enterprise. I think that the Commission has been unanimous on that subject up to at least the 18th of January of this year.

There is a further provision in section 44 of the present statute, the Atomic Energy Act of 1954, which effectively prohibits the Commission from the production and sale of power except from experimental reactors. This condition would foreclose the Commission from the construction and operation of reactors for any purpose except pure experiment.

AEC DIFFERENCES ON POLICY

In that connection, in order that the position of the majority of the Commission may be clear on the record, but without necessarily taking the time of your committee to recite a position which I think is familiar to you all, I would ask permission to insert in the record at this point a statement which I made on behalf of the majority of the Commission in respect to the bills presently before the Congress, intro-

duced by Senator Gore and Congressman Holifield in this particular connection.

Chairman CANNON. Admiral Strauss, it would be a rather remarkable situation if any Commission was unanimous on any point. We shall be glad to consider any matter you wish to submit to us. Hand it to the clerk and we will take it up in regular order.

Mr. STRAUSS. I will do so. I would also like to say that it would be remarkable if a Commission such as ours would be continually unanimous. I don't believe in the desirability of continuous unanimity. I think a dissent is healthy. I have been frequently in the minority myself. I have never been ashamed of it. It is for that reason that I believe a commission rather than a single administrator is the desirable form for this organization to take. But we were unanimous on this point until quite recently and the reasons which have occasioned my colleague to change his point of view are not clear to me.

Chairman CANNON. Is there anything further, Mr. Rabaut?

Mr. RABAUT. You said everything was in agreement until the 18th of January.

Mr. STRAUSS. As late as that.

Mr. RABAUT. Why did you mention that date?

Mr. STRAUSS. Because that was the last date that Commissioner Murray expressed himself to the Commission on that subject. At that time he was opposed to Government funds for the construction of power reactors. On January 30, before the Joint Committee, he changed that point of view, which is a privilege I would risk my life to defend, but his reasoning is not known to me.

Mr. JAMES C. MURRAY. Mr. Chairman, may I ask one question?

Chairman CANNON. Mr. Murray.

Mr. JAMES C. MURRAY. I am not too clear on your opening statement, Admiral Strauss. Is it your contention that the legislative enactment precludes the Commission from going into this?

Mr. STRAUSS. Yes. I can read you that section of the law, if I have it here, and I think I do.

Mr. JAMES C. MURRAY. I was wondering if you have your counsel's opinion as to whether or not the act precludes you or not.

Mr. STRAUSS. This section of this law followed protracted debate. The legislative history makes the matter, I believe, abundantly clear. But the two sections to which I have reference, sir, are, first, chapter I, section 1 (b):

> The development, use, and control of atomic energy shall be directed so as to promote world peace and improve the general welfare, increase the standard of living—

and I am emphasizing this—

> strengthen free competition in private enterprise.

Section 44 reads as follows. I am skipping the first several sentences in that section. The concluding sentence reads:

> Nothing in this act shall be construed to authorize the Commission to engage in the sale or distribution of energy for commercial use except such energy as may be produced by the Commission incident to the operation of research and development facilities of the Commission or of production facilities of the Commission.

Chairman CANNON. We now take up the question of the role of AEC in civilian reactor development. But I will ask Commissioner Murray to complete the general statement which he was making when the committee was adjourned.

Mr. THOMAS E. MURRAY. I did complete my statement as far as I wanted to go yesterday.

Chairman CANNON. You may supplement it as you wish, Mr. Murray.

INSURANCE PROBLEM

Mr. THOMAS E. MURRAY. If I gave the impression that I wanted to limit the question of insurance to a particular group of reactors, we will say the power demonstration reactors, I didn't want to give you that impression.

The impression I wanted to leave with you yesterday, and I think this Commission is unanimous on it, is that we have to get ahead with this business of reactors. They are experimental reactors, whether they are 20,000 kilowatts or whether they are 150,000 kilowatts. In my book they are experimental reactors. I tried to give the impression that, if you did give us legislation to cover this insurance problem, it would not be legislation that would carry on indefinitely. It would be least cover situations like our power demonstration program; it would also cover a situation like the Consolidated Edison project where a firm is going ahead and putting up its own money; it would cover the second round, and so on. I didn't want in any way to give the impression that I would limit the insurance because every one of these reactors that we go ahead with, the Commission will have to approve. It will have to furnish fissionable material. It will have to determine that it will add to the art. Once that decision is made, then I think provision for insurance would follow automatically. If I gave the other impression yesterday, as the chairman has indicated, I wish to change that.

CONSTRUCTION OF SIX POWER REACTORS

Mr. JENSEN. Mr. Chairman, I would like to clear up one point. Mr. Murray has suggested the building of six power reactors. I would like to know if Admiral Strauss is in agreement with that, or does the admiral think that we need legislation before we can go ahead with the building of those reactors?

Mr. STRAUSS. It is my belief that legislation would be necessary, but I would be opposed to such legislation and have recorded the opinion of the majority of the Commission as opposed to such legislation.

Mr. JENSEN. The majority of the Commission is opposed to the building of the six large reactors?

Mr. STRAUSS. To the Gore bill, which specifically would direct the Commission to erect a number of reactors at diversified locations about the United States.

Mr. JENSEN. In view of that legislation, the Gore bill, which you speak of, does the majority of the Commission have some recommendations?

Mr. STRAUSS. No, sir. We have not been requested, nor, so far as I know, have the individual Commissioners given attention to a statute

or something in lieu of that for the reason—in my own case—that I do not believe that it serves the purpose of advancing the art, but that, on the contrary, the enactment of such legislation would delay and hinder the development of the atomic-power project in the United States.

Mr. JENSEN. Is your reason for taking that position—the majority of the Commission taking that position—due to the fact that you feel that you have not advanced far enough yet in your scientific research to expend the hundreds of millions of dollars required for the building of these reactors?

Mr. STRAUSS. No, sir. It is for the reason that we believe that each reactor concept which has reached the stage for large-scale construction is either in construction, in plan, or in negotiation with the Commission, and that if subsequent projects reach such a stage we would hope to obtain the cooperation and the financial contribution of industry to erect such plants. In the event that we fail to obtain industrial private capital, we then would consider approaching this committee for an appropriation of funds, having first obtained authorization from the Joint Committee in order to do so.

Mr. JENSEN. Thank you.

Chairman CANNON. Mr. Rabaut.

INSURANCE PROBLEM

Mr. RABAUT. Following my talk of a few minutes ago, when I said there is no yardstick for the insurance companies to go by, I feel it is the consensus of both the Commission and of the members of the committee here that whatever arrangements would be made about insurance, and whatever rates would be set, should be of a temporary nature until we find out something about it. I think it should be in the record for the benefit of all that read it that it should be a temporary arrangement, with an idea of coming to something more solid after there has been accumulated some sort of experience for setting a rate. Is that the way the Commisson feels about it?

Mr. STRAUSS. That is right, Mr. Rabaut. This is an experimental period, and I would anticipate, barring some catastrophe, which I certainly do not anticipate, that those rates will decline with the accumulation of experience. Furthermore, the amount of dollar coverage from the insurance companies will increase.

Mr. RABAUT. That is all, Mr. Chairman.

Mr. PHILLIPS. Will you yield for a second?

Mr. RABAUT. I yield.

Mr. PHILLIPS. I think the point is excellent. I think all that is needed in the picture is an actuarial background of some kind. I offered the other day as an illustration the experience of the medical profession which went through this with liability insurance. I offer now the experience of the airplane industry. When you and I started to fly a good many years ago, probably some of your life insurance policies would not cover an accident in the air. I think all of them will cover it now. In those days you could probably get a thousand dollars as maximum insurance. Now I can get $62,500.

Your point is well taken. I think that is exactly what this industry is now facing.

Mr. RABAUT. I think before that it was for 1 passage, and now it is for a whole trip, or both ways under 1 policy.

Chairman CANNON. Mr. Riley.

Mr. RILEY. Not only, Mr. Strauss, would you have the experience of the insurance companies, but as these reactors are built, you would have a diversified risk.

Mr. STRAUSS. Yes; that is right.

Mr. RILEY. I don't believe it has been brought out or at least I have not heard it, that the cost of this insurance would in all probability be taken into consideration in making the rates at which this power would be sold. So the consumers would really pay the premium.

As I said yesterday, the Government would only be liable for the excess insurance which in most instances is not used unless you have a major catastrophe.

Mr. STRAUSS. That is my belief, sir.

Mr. RILEY. Thank you, sir.

SALE OR DISTRIBUTION OF ENERGY FOR COMMERCIAL USE

Chairman CANNON. Apparently the 1954 Atomic Energy Act enjoins the Commission from setting itself up in the nuclear business. Apparently it forbids your producing and selling nuclear power except as a byproduct.

Mr. STRAUSS. That is right, sir.

Chairman CANNON. You may not subsidize a public or private power group except in a research way which will develop the nuclear energy for the good of all. What is the Commission's interpretation of the 1954 Atomic Energy Act in that respect?

Mr. STRAUSS. In view of the fact, Mr. Chairman, that the General Counsel of the Commission is here, and that an interpretation should be properly expressed in legal terms, may I ask him to answer that question, sir

Chairman CANNON. Mr. Mitchell.

Mr. MITCHELL. Mr. Chairman, under section 31 of the Atomic Energy Act of 1954, the Commission is both authorized and directed to make arrangements, including contracts, agreements, and loans, for the conduct of research and development activities relating to various purposes, one of which entails the production of atomic energy for all other purposes, including industrial uses, the generation of useable energy, and the demonstration of the practical value of utilization or production facilities for industrial or commercial purposes.

So I think it is clear that the Commission does have the basic authority to engage in research and development activities which would include the construction and operation of full-scale reactors, where this was a research and development effort.

As the chairman has pointed out, in section 44 the Commission is prohibited from engaging in the sale or distribution of energy for commercial use except as such energy may be incident to research and development activities or to the production activities of the Commission. In this sense production means production of special nuclear material. I think that summarizes it, sir.

COMMISSION'S RESPONSIBILITY FOR AGGRESSIVE AND COMPREHENSIVE DEVELOPMENT OF NUCLEAR POWER

Chairman CANNON. Apparently the Atomic Energy Commission recognizes that the national policy is that the Commission should accept responsibility for the advancement of power-reactor technology, and aggressively pursue its development.

Also, that the Commission must set the pace to provide many of the very expensive development facilities and insure that all important phases of the research and development program are adequately covered.

We would like to have an expression, Admiral Strauss, of your view on this subject from yourself and from the other members of the Commission.

Mr. STRAUSS. Would you mind, Mr. Chairman, restating the subject again, sir, so that I have it clearly in mind?

Chairman CANNON. The national policy is that the Commission should accept responsibility for the advancement of power-reactor technology and should aggressively pursue its development. That is the first proposition.

The second proposition is that the Commission set the pace, and provide the very expensive development facilities and insure that all important phases of the research and development program are adequately covered.

Mr. STRAUSS. In compliance with that objective, Mr. Chairman, the Commission has been proceeding, as I have said, on a broad front to develop all the promising uses of atomic energy of which we have knowledge. The achievement of economical nuclear power—and I emphasize the word "economical"—will present a very important technological breakthrough. We believe that is a breakthrough which is certain to be achieved. Therefore the Commission is acting on the principle that the development of economical nuclear power, both in the United States and overseas, is a program of importance to the Nation and of urgency. There is no disagreement among any members of the Commission on that point.

Chairman CANNON. You say the development of economical power. Is that an essential part of this program?

Mr. STRAUSS. It is in the opinion of the majority of the Commission an essential part of the program because we know perfectly well that we could cover the country with power that would be uneconomical. There is no question whatever of that.

Chairman CANNON. It may be taken for granted that no other country is limiting its research to what would be economical. Isn't it possible that what might now not be economical, later may become economical? As a matter of fact, that is the trend of most of our research problems.

NUCLEAR POWER PROGRAMS OF OTHER COUNTRIES

Mr. STRAUSS. I cannot speak with certain knowledge at to what other countries are doing. I can say with respect to Great Britain, Mr. Chairman, their power program at the present time is a byproduct of their weapons program. That is to say, they are building reactors to produce plutonium to put into bombs.

Chairman CANNON. That is not true of our program.

Mr. STRAUSS. That is not true of our program because we began in 1943 to build reactors at Hanford and we continued in 1950 and 1951 in a building program at Savannah River to build reactors for the production of plutonium. The heat from these reactors is not used. It was the belief of the majority of the Commission—I differ with this, I came on the Commission with a dissent—but the Commission before I joined it had stated that it believed, and we have adhered to this, that the dual-purpose reactor, the reactor which produced both plutonium and power, was not a proper avenue for the expenditure of our funds and research. We have concentrated, therefore, on reactors which produced plutonium and tritium alone, and reactors which produced power alone.

The sound argument, which could not be refuted, of the Commission on this point was that you would not know the cost of power if there was a byproduct for which the piles were also designed. That is why the Commission has gone along on that route.

The British statement yesterday, reported in the papers this morning, by Sir John Cockcroft, their principal scientific adviser, is that their first plant for the production of power only would probably come into operation in 1970. This is rather later than any estimate I had heard. I had heard they would have their first atomic plants to produce power only in the early sixties. As far as the Russians are concerned, I have nothing but their announcement.

As Commissioner Murray stated yesterday, and I completely concur, I could not believe any announcement that comes out of Russia.

Chairman CANNON. In other words, Admiral, we have a broader field than the field which the British are exploring.

Mr. STRAUSS. Yes, sir.

Chairman CANNON. They are more limited in their schedule than we are.

Mr. STRAUSS. Yes, sir. They have actually gone so far as to propose that there should be a division of effort: that the British would confine their research to one type of reactors, the gas cooled; that the Canadians would limit their reactors to heavy water cooled; and we would take liquid metal and others. We are, as a matter of fact, following every avenue that we know of, and will continue to do so since we do not believe that it is incumbent upon us to divide up the field.

There is also the additional factor which I think your committee realizes, that the British have a totally different concept of economic nuclear electricity than we do.

Chairman CANNON. Still it is within the range of possibility that they might develop an economic reactor sooner than we do.

Mr. STRAUSS. It is within the range of possibility, but based on present progress and present research, I would consider it highly improbable.

RUSSIA'S NUCLEAR DEVELOPMENTS

Chairman CANNON. Russia has no limitation of any kind on its field of inquiry.

Mr. STRAUSS. None that I know of.

Chairman CANNON. A map was displayed at Geneva of this plant which is said to have been in operation for some time, and it seems to me that plant was seen by some of our scientists.

Mr. STRAUSS. That is right.

Chairman CANNON. That would indicate that they are ahead of either the British or ourselves.

Mr. STRAUSS. No, sir; that plant is a Model T Ford compared with anything we have. It is said to generate 5,000 kilowatts. It is a fraction as large as the plant—may I go off the record here to give you some information?

Chairman CANNON. Yes. Off the record.

(Discussion off the record.)

Chairman CANNON. Back on the record. We did not even have a Model T Ford at that time?

Mr. STRAUSS. We had the Arco plant in 1953.

Chairman CANNON. Do you think that the Arco plant antedates the Russian plant?

Mr. STRAUSS. They said they have had theirs since 1954, I don't know whether they did or not. If they had it as early as they said they had it, they had it a year after we had ours and it really is a Model T Ford. They may have other plants.

Mr. TABER. Do you want that in the record?

Mr. STRAUSS. I would like to have that criticism of their plant eliminated from the record in the interest of comity.

Chairman CANNON. It is a matter of common notice in all the newspapers. I see no reason why it should be classified.

This is what impresses me. Here is a plant which has been supplying a community, Admiral Strauss, with all needed electricity since 1954. We have had nothing of that sort.

Mr. STRAUSS. We understand, Mr. Chairman—and this is not of my personal knowledge—that there is a standby steam plant of that capacity which takes care of the situation.

Chairman CANNON. You say a standby?

Mr. STRAUSS. They have a standby conventional steam plant which takes care of that situation when the plant is not operating, and we have no figures as to what percentage of the time they are getting their power from the steam plant and what percentage of the time they get it from the atomic plant.

Chairman CANNON. We have been told that the *Nautilus* also has a standby plant.

Mr. STRAUSS. The *Nautilus* has a plant for emergency purposes. But the *Nautilus*, as you know, has given more satisfactory service from its prime mover than any other submarine in our history.

Chairman CANNON. Of course, the facts are, Admiral Strauss, that any electric plant must have a standby arrangement. That is essential and indispensable. If the Russian people have this standby plant, that differs in no respect from any other plant producing electric power with which we are familiar.

Mr. STRAUSS. I think there is this difference. Plants sometimes have additional capacity to permit overhaul of one generator while another generator is producing power. But as I understand it, this is a complete installation, separate and distinct, which is designed to take over when the other plant is idle.

Chairman CANNON. Commissioner Vance, we would like to have an expression of your views. I will restate it so that we will have it clearly before us.

The national policy is that the Commision should accept responsibility for the advancement of power reactor technology and aggressively pursue its development. That is the first proposition.

The second proposition is that the Commission must set the pace and provide many of the very expensive development facilities and insure that all important phases of the research and development program are adequately covered.

Mr. STRAUSS. Mr. Chairman, will you give me an opportunity to complete my response?

Chairman CANNON. I beg your pardon. I thought you had completed it.

Mr. STRAUSS. No, sir.

Chairman CANNON. We shall be glad to hear you further.

Mr. STRAUSS. I am quite prepared to take it later.

Chairman CANNON. You may proceed. I thought you had concluded your remarks.

Mr. STRAUSS. I feel that what I had said was not completely responsive to your question, and as this is to be a public record, I did not want it to appear that I had been cavalier in my answer.

Chairman CANNON. You may proceed.

Mr. STRAUSS. Thank you, sir.

METHOD OF DEVELOPING COMPETITIVE ECONOMIC NUCLEAR POWER

I said a moment ago that the program was important and urgent, and that we construed it as the development of economical nuclear power. The question then is not one of objectives, but one of method. What is the best way to achieve economically competitive nuclear power.

Chairman CANNON. Mr. Commissioner, did you give that document to the clerk?

Mr. STRAUSS. No, sir.

Chairman CANNON. May we have it now?

Mr. STRAUSS. Yes, sir.

(Discussion off the record.)

Mr. STRAUSS. We have, Mr. Chairman, as our method for developing competitive economic nuclear power in the United States conceived that the principle of each reactor concept should be worked out in our laboratories; that experimental plants—and these experimental plants are of considerable size, but they do not run up to 20, 40, and 100,000 kilowatts or anything like it—should be built at these laboratories; and that when their feasibility has been demonstrated, we should seek either through a power demonstration program such as we have, or by negotiations with private contractors, or public cooperatives, to obtain a project to build and operate such a reactor.

We think that has been successful thus far. We hope that it will be successful in the future. As I said a few moments ago, in the event that the Commission finds a reactor concept which some private industry or public power association declines to develop, we will under those circumstances have to consider going ahead with public funds. We have no reason to suppose at the present time that that situation is either imminent or likely.

That, Mr. Chairman, I think would conclude my answer to the question.

Chairman CANNON. Commissioner Vance.

DIFFERENT REACTORS UNDER DEVELOPMENT

Mr. VANCE. Mr. Chairman, I call attention to the fact that yesterday Mr. Davis spoke to you about nine different concepts of reactors, all of which are under study at the present time. The fact that we are presently pursuing research and development in nine different fields indicates, I thing very clearly, that as yet none of these concepts has emerged as clearly the best of the lot, so to speak, because otherwise if one had so emerged we would be concentrating our efforts on it.

One of the concepts explained to you yesterday by Mr. Davis was the aqueous homogeneous reactor. A second experimental reactor of this type has been built at Oak Ridge, and is very close to becoming critical. I think it will be in operation in a matter of weeks or certainly within several months.

It is my own personal opinion that this particular type of reactor holds great promise, and if it does, then it may emerge as the type of reactor which we should press as hard as we can.

One of the reasons why I feel that it holds great promise is that the major problem to be licked in this particular reactor is in the field of metallurgy. That is to say, the major problem is one of corrosion. In that particular field we are dealing in an area where over the years we have accumulated a great deal of information. I think for that reason that we probably can make great progress as compared with some other fields which are beyond the frontier of engineering knowledge.

TIMING AS FACTOR IN DEVELOPMENT OF NUCLEAR POWER

Therefore, it seems to me that this matter of building reactors of the large-scale type, whether they be built by private enterprise, or by Government, or by a combination of the two, may well wait until it is clearer to us which one of the horses in this race seems to be ahead. Therefore, I see that such differences as exist in the minds of the different Commissioners are very largely questions of timing rather than ultimate objectives.

Chairman CANNON. Commissioner Murray.

Mr. THOMAS E. MURRAY. I would like to reecho part of what Mr. Vance has just expressed to your committee, and that is, it is a question of timing. As I mentioned yesterday, if you make up your mind or if you decide as a question of national policy and if you recognize that there is an urgency to get nuclear power developed at an early date, then I think my program makes sense. I think the program that I have suggested would give a great boost, and would accelerate the development of economical power.

Chairman CANNON. It has been suggested that the need for progress is so acute that we should adopt a crash program.

Mr. THOMAS E. MURRAY. As I said yesterday, the words "crash program" always grate on my nerves. It is a question of reorientation, reorganization of our thinking, reorganization of our whole atomic staff, and so on. In order to face that question, you must decide whether you want power at a certain date. Do you want economical power? Does that power have to compete with 4-mill power or 5-mill power in the Ohio Valley? If you make the decision that

it does before going ahead, then you don't do anything except what the majority of the Commission today is recommending, that we build these small experimental plants, and we feel our way and we find out the trouble with zirconium and hafnium and stainless steel and so on.

Chairman CANNON. I would like to ask, can you determine the basic fundamental principles as definitely and as accurately from a small plant as you would from one of the behemoth plants that are being considered?

Mr. THOMAS E. MURRAY. I don't believe you can really get the experience and the necessary information that you need until you build a large plant. Let me say this to you. Yesterday the question of the pressurized-water reactor was raised. We decided back in 1953 to go ahead with a pressurized-water reactor of 60,000 kilowatts—that may produce 100,000 kilowatts—of electrical energy.

If we had followed the principle that is now being laid down by the majority of the Commission, you would have never started the PWR. As a matter of fact, at that time I can't remember a single person, including the entire General Advisory Committee, that was not opposed to the building of that particular plant because of the economics of the plant. It was predicted at that time that the kilowatt cost from that plant might be as high as 50 mills. Somebody said, "Can we afford 50-mill power?" My answer to it was then, and it is now, that we cannot afford not to find out what is the answer to nuclear power. I can visualize that in the future, not only for this country's need but for the world's need, we must get some of the answers, and get them rather quickly, as to what we can expect from these nuclear power-plants. Again I say that the whole difference of approach here is how important is it to get ahead with the job.

I agree with Mr. Vance that the technology for the homogeneous reactor, for example, has not been fully developed. All of the kinks are not out and all of the problems involved have not been solved. But I am firmly convinced that if you made up your mind to build a large homogeneous reactor, then you would face up to the various problems and you would force technology to keep step and to get in tune with our program.

I could read you many pages that I have submitted to the Joint Committee on this very subject, but I think it all boils down to that one fundamental fact. What is the national policy in relation to the development of nuclear power?

You used the word "aggressively," Mr. Chairman.

Chairman CANNON. I might also have said expeditiously.

Mr. THOMAS E. MURRAY. Maybe our program is an aggressive program. It may be. But if you ask me, for example, how much power you are going to get in large quantities by 1960, I would have to tell you that the only power you are going to get in 1960, from the way I look at it, is the power that is coming from the Shippingport plant.

COMMISSIONER MURRAY'S STATEMENT ON OUR NATIONAL POLICY FOR DEVELOPMENT OF NUCLEAR POWER

At the present time the development of all these large reactor concepts is dependent on how aggressively private industry decides to go ahead with the job. If you would permit, and I don't want to read it now, I would like to submit the statement for the record that I made

last week. It might clarify some of these points and bring them out a little more clearly.

(The statement is as follows:)

STATEMENT OF COMMISSIONER THOMAS E. MURRAY, UNITED STATES ATOMIC ENERGY COMMISSION, SUBMITTED TO THE JOINT COMMITTEE ON ATOMIC ENERGY JUNE 18, 1956

My views on a national policy for the development of industrial atomic power are importantly influenced by the ever-increasing threat of nuclear weapons to the continued existence of mankind. Echoing a warning which I previously voiced, a recent report by a group of outstanding scientists notes the possibility that the detonation of enough of these weapons could render the entire earth, or a large portion of it, uninhabitable.

I have on prior occasions before your committee endeavored to demonstrate the relationship between this threat and our atomic power program. Once again, however, the dimensions of this danger were impressed on my conscience as I recently witnessed a nuclear explosion in the far Pacific. The possible implications for man's future, so vividly illustrated, compel me again to urge the acceleration of this Nation's progress in the field of peacetime power reactors.

The present prospect of getting any substantial quantity of industrial atomic power in this country by 1960 is very gloomy—and getting more gloomy every day. At the root of the matter is the fact that the Government has prematurely abdicated to private industry the primary responsibility for building large power reactors. Under our present policies, with one notable exception, the Commission's activities in the field of large power reactors are confined to research and development, small scale pilot-plant construction, and limited assistance to participants under the power demonstration program.

Our immediate national effort in the field of large scale power reactor construction is limited to this demonstration program as supplemented by other activities under the licensing provisions of the Atomic Energy Act. Thus our progress is in the greater part based upon decisions by either participants or licensees as to what type of reactors to construct and at what time to begin constructing them.

Under these procedures four basically different large-scale reactor types are being explored. Some of these reactor types have now come to be accepted as the domain of an individual company or group of companies. For example, the Detroit Edison group is identified with the fast breeder reactor; North American with the sodium graphite reactor; and Commonwealth Edison and its associates with the boiling reactor. Yet the public is given the impression of a massive attack toward industrial nuclear power carried forward by private industry on each sector of the front. Let us examine the situation more closely to determine how rapidly this massive attack is advancing.

The fast breeder reactor area has been staked out by Detroit Edison and its associates. In addition to the many technical obstacles involved in this project there are other difficulties cited as barriers to progress. Unless the problems relating to third-party liability insurance and exemptions from the Public Utility Holding Company Act are solved in a manner satisfactory to the Detroit Edison group the project is not likely to get beyond the initial stages.

Another technical area that has been staked out is that of the sodium graphite reactor. North American Aviation plans to construct a full-scale reactor of this type rated at 75,000 kilowatts for the Consumers Public Power District of Nebraska. However, this project is contingent upon obtaining satisfactory results from the operation of a small experimental reactor now under construction. In my opinion these results will not be known until 1958. Thus we are faced with a possible delay of 2 years before a decision is made as to whether or not to construct this important type of power reactor. Moreover, there is a serious question whether a public power group can afford to take the financial risks inherent in this project.

Yankee Atomic Electric Co. presently plans to construct a large reactor of the pressurized water type. Under a contract with Yankee the Commission has agreed to provide certain financial and other support for this project. However, the contract does not establish any date for completion; neither does it provide any penalty for withdrawal. It does have a provision that the contract may be modified by the parties to provide for a different reactor or design in the event that estimated power costs substantially exceed the original estimates on which the proposal is based.

In addition to the reactor types represented by these projects there is another class of considerable importance; namely, aqueous homogeneous reactors. Pennsylvania Power & Light has announced its intention to build a reactor of this class for operation in 1962. However, actual construction is contingent on prior proof that construction would be economically justified. This contingency casts grave doubt on the projected completion date of 1962. This project, of such a tentative nature, is the only plan which contemplates constructing a large-size homogeneous reactor.

There are those who believe that our present program is an adequate one. In support of this view the argument is advanced that our efforts are sufficient to enable us to remain ahead of the Soviets. To my mind, however, our program should not be paced solely on estimates of what the Soviets and other nations are doing or intend to do in the power reactor field. Nor should we allow ourselves to become embroiled in arguments over estimates that are made of Soviet capabilities, and so permit such arguments to become the basis for delay. What is required is that we recognize the need for action and that we take this action unilaterally and independently of the actions of other nations.

Right action should follow if we recognize the central fact that the development of industrial atomic power is not a matter of choice, but of necessity. Electric power is the very lifeblood of nations and the hope of the have-not countries. The upward trend in world population, the accelerated industrialization of underdeveloped areas, and the progressively growing per capita utilization of energy all imply increasing requirements for electric power. On the other hand, there is a limit on the amount of conventional fuels which will be available. Nuclear fuels will be required to meet the increasing demand.

Already in certain areas abroad fuel shortages are beginning to appear, notably among the highly industrialized nations of Western Europe and in Japan. In such countries imported fuels are being used to supplement dwindling fuel reserves. For example, in the case of Western Europe the total net expenditures for fuel imports have been estimated as between $1.5 and $2 billion for 1955, and these are expected to increase to $5 billion by 1975. The problem of fuel shortages in Japan was one of the considerations that led me in 1954 to propose the construction of a large power reactor in Japan.

The United Kingdom has abandoned the idea that coal and oil can meet her expanding requirements for electric energy and has undertaken the active development of atomic electric power as a matter of national policy. The goal of its program is to develop this new source of power so as to provide a major portion of Britain's electric energy requirements as soon as possible. Concretely it envisages building a large number of power stations with an installed capacity of 1½ million or more kilowatts by 1965.

We should recognize of course that such a program will place the United Kingdom in an excellent position to export large power reactors. Mr. R. N. Millar, manager, atomic energy department of the General Electric Co., Ltd., puts the case quite forthrightly in these words: "In Britain the emphasis is on large central stations * * *. When the export, drive gets underway it will be backed by sound practical experience in a large home market, an advantage which will not be shared by America."

What the atomic power pattern will be in underdeveloped countries is difficult to discern in detail. It will depend in part on our willingness to aid these countries in answer to their pleas for improved standards of living. Yet the needs of these countries for electric power is beyond question. One has only to realize that the present per capita consumption of electricity in the United States is 600 times that in Haiti and 200 times that in Ceylon to understand the differences in the respective standards of living which these figures imply and the serious problems involved.

It is appropriate to ask how the electric energy needs of these countries will be met. Where conventional fuels are inaccessible or otherwise unavailable the clear answer will be through nuclear power. In other cases conventional fuels will present a solution under present economic conditions. But looking beyond the present it will be evident in many cases that conventional fuels alone cannot form a stable basis to meet long-term needs. Nuclear power, however, can furnish long-term solutions. Sound planning indicates that such nations must begin now to integrate nuclear power into their economy. We should be prepared to assist them.

If action is not forthcoming to break the monopoly now enjoyed by private industry in the large industrial reactor program, we will not be prepared. It is evident to me that without such action the only significant amount of electric

power that will be available in this country in 1960 will be the kilowatts coming from the Shippingport plant, the construction of which is largely being financed by the Government.

On February 23, 1956, I proposed that we adopt a national policy which treats the development of industrial atomic power as a matter of urgency. I made certain recommendations as to how this policy should be implemented. One of these recommendations was that we establish a goal of 2 million kilowatts for the construction of power reactors, here and abroad, between now and 1960.

It is important to emphasize the significance and importance of goals. Adoption of a goal, simply and forthrightly stated, has, in my experience, been the sure way and the practical way to give direction to a complex program. It has the merit of bringing order into all the diverse efforts involved. It becomes the practical gage against which progress is measured. Intelligently used, it becomes the spur to achievement.

This has been already significantly demonstrated in our own atomic energy program, where I insisted on raising our goals to bring about a revolutionary improvement in ore procurement. This experience encouraged me to attack the industrial nuclear power problem in the same way; that is, by recommending the establishing of goals in terms of kilowatts.

I also recommended last February that the Government assume the primary responsibility for meeting the objectives I suggested for the period between now and 1960. Consistent with this proposal I now urge that the Government undertake to construct several large power reactors.

One of these reactors should be an enlarged and improved version of the pressurized water reactor now being constructed at Shippingport. All the valuable lessons learned and extensive experience acquired in the course of developing and constructing this plant would be incorporated. An expansion of effort of this kind is required if the United States is to take the greatest advantage of its progress in this field. There is, for example, the need to enlarge our capabilities for testing the new and improved core designs for this type of reactor. Since the first core of the Shippingport plant will last approximately 2 years, the loading of an improved core at Shippingport will not take place until 1959. Another facility would advance the testing of new core concepts.

The Government should build one large-size, aqueous homogeneous reactor. As I have previously indicated there are at the present no firm plans for constructing a large reactor of this variety. I recommend that the Government step into this gap. Unless such a project is instituted the homogeneous reactor is destined to remain in the research and development stage for many years to come.

There are other areas of reactor technology which have received relatively little attention in our programs. One is the gas-cooled reactor; another is the natural-uranium reactor. There are several variants of both types. I would propose to build a large-scale plant of each of these kinds of reactors along whatever lines hold promise of the greatest contribution to nuclear power.

An important consideration in constructing these reactors is the manner of disposing of the power they produce. My recommendation is that they be placed at the sites of our production facilities, which today require a capacity of about 7 million kilowatts. Such tremendous electric power requirements could well absorb the output of these reactors with only barely discernible effect on the cost of weapons. Moreover, the small contribution of atomic power to the total demand would make it possible to carry out experimental operation of these reactors without affecting production of weapons materials.

Construction of a large-scale sodium graphite reactor in the near future presents a different problem. To solve it I propose an approach that differs in detail, but not in principle. Concretely, I would have the Government assume the responsibility for building a large-scale reactor of this type. It could be located in Nebraska and the power made available to the Consumers Public Power District. North American Aviation would continue to develop and construct the plant. Such a plan would permit research and development to be stepped up from its present inadequate level. This is the only way that I can see to bring this reactor into operation at an early date.

Taken together, these proposals for constructing large reactors constitute a well integrated program with two exceptions. They do not guarantee sufficient progress on the boiling-water reactor and the fast-breeder reactor. Both require more extensive investigation. Without specifying the precise method it suffices to say that the Government must insure that construction of such reactors goes ahead.

It is, of course, easy to conjure up reasons for not undertaking such a program as I propose. There is always the appealing alternate of convening committees and task forces to formulate arguments for inaction. One such argument is that it would result in an unjustifiable drain on the Nation's limited supply of scientific and engineering manpower. I do not subscribe to this argument. Far from decreasing the numbers of those trained in reactor technology a program of building reactors should act to increase them. There is no way of training competent reactor engineers that is comparable to designing and building reactors. A predominant effect of a large and assured program of reactor construction would be an increase in the numbers of those attracted to the reactor engineering field.

There are many reasons why private industry should favor the Government's undertaking the program that I have outlined. A first consequence of such an effort would be that the Government would bring its immense resources to bear in eliminating the technical obstacles that are now impeding private industry's program. This would react to decrease the cost and increase the likelihood of success of private industry's plans to construct large reactors. The resulting progress would assure for American manufacturers a place in the world market for industrial power reactors.

In addition, a Government program of the scope proposed would not only provide an assured base for the construction of large power reactors but would also serve to increase overall industry participation in the atomic energy field. It would, for example, encourage private industry to undertake to provide services such as fabrication and chemical processing of reactor fuels.

Private industry needs the assistance which a Government program of large reactor construction would give. Yet the view prevails that private industry is prepared to undertake the crucial and costly phase of reactor development which large scale construction represents. The prevalence of this view derives from the fact that atomic power has been oversold. Millions of people have been given the impression that electricity from the atom is just around the corner. However, our present knowledge is so meager that, in the absence of an accelerated program, the corner is 10, 15, or more years away. Such an accelerated program will not be forthcoming as long as we rely on our present policies which make the economics of nuclear power in the United States the consideration governing progress.

It is a tragic mistake for this Nation to base its atomic power program primarily on our own economic interests. To do this is to fail to recognize the vast political and humanitarian implications of atomic energy throughout the world. It is to follow a course which is at variance with our own larger interests, and more importantly, with all that this Nation stands for.

The fact that we are taking this course is the result of fear; fear by private industry that Government will enter the power business as a consequence of its accelerating development through power reactor construction. Such fears are unwarranted; they cannot rightly be countenanced as cause for delay.

Acceleration of reactor development by the Government will not jeopardize the role of private industry in power production. Irrespective of who develops it, when industrial atomic power becomes available, the Government can use it to produce electricity, should it so desire. In this respect nuclear power does not differ from power which is produced from conventional fuels.

The traditional role of private industry in the production of electric power must be preserved. But private industry is not helped by an artificial argument which seeks to preserve industrial atomic power as private industry's domain at the expense of the national interest as well as its own particular interests.

It requires no great powers of discernment to understand what the national interest requires in the development of atomic power. One has only to view the problem in the light of already massive and constantly growing proportions of the threat from developments in nuclear weapons. Had representatives of private industry stood with me and watched a recent nuclear explosion, I am confident that they would recognize the nuclear threat to civilization. I am further confident that they would endorse the most urgent measures to accelerate the development of industrial atomic power.

It is the urgent need for action of this type which causes me to submit this statement to your committee. I have read many statements assuring you that our industrial atomic power program is adequate. My responsibility compels me to alert you, as I have on other occasions, to the fact that I can give you no such assurance.

I believe that our present program will not enable us to fulfill our responsibilities with respect to the early development of industrial atomic power. The Commission must continue its basic research and development activities as well

as continue its support to private industry under the power demonstration program. However, if we are to keep our repeated and widely publicized promises to make available the benefits of atomic power to mankind at an early date we must do more. The only way I know to discharge our responsibilities and redeem our pledges is for the Government to assume the primary responsibility for large reactor construction. In order to do this I strongly recommend that Congress enact legislation similar to that proposed by Senator Albert Gore and Congressman Chet Holifield. This legislation should provide for a program of large power reactor construction generally along the lines I have proposed and at the locations I have suggested.

LARGE VERSUS SMALL PLANTS

Mr. ANDERSEN. Mr. Chairman, could I ask a question for clarification?

Chairman CANNON. Mr. Andersen.

Mr. ANDERSEN. Would you define for me personally what you mean by a large plant versus a small one, Mr. Murray?

Mr. THOMAS E. MURRAY. Yes. I think a large plant is in the neighborhood of 100,000 kilowatts, against a 5,000-kilowatt plant.

Mr. ANDERSEN. When you were referring to a large plant, you had something in mind of 100,000 kilowatts?

Mr. THOMAS E. MURRAY. From 100,000 to 200,000 kilowatts.

Mr. ANDERSEN. Thank you, sir.

Chairman CANNON. Mr. Roddis, the Deputy Director of the Division of Reactor Development, in discussing the subject, made this very relevant statement. He said:

I think you must be impressed, as I am, by the variety of different reactor designs that are being worked with or being given serious consideration. The situation is something like that in the early days of the electrical industry when motors and generators followed a variety of wierd designs, a far cry from their streamlined efficient shapes of today.

Would you say the Commission agrees with Mr. Roddis on that?

Mr. THOMAS E. MURRAY. I think so, yes. At least I do.

Chairman CANNON. Dr. Libby, we will be glad to have your views.

Mr. JENSEN. Mr. Chairman, Dr. Libby has not heard your question.

COMMISSIONER LIBBY'S VIEWS

Chairman CANNON. I will repeat the question. We would like to have your views on two questions. Recognition of national policy that the Commission should accept responsibility for advancement of the power reactor technology and aggressively pursue its development. That is the first point.

The second point is that the Commission must set the pace and provide many of the very expensive development facilities and assure that all important phases of the research and development program are adequately covered.

What would you say as to that, Dr. Libby.

Dr. LIBBY. I want to apologize for being late, Mr. Chairman. I was detained on Commission business.

To the first question, "Is the AEC responsible for developing atomic power?" the answer is "Yes." It certainly is in every sense of the word. Our objective to develop the peaceful uses of the atom should be achieved as rapidly as we can. We are charged with this responsibility and it is our duty to do it.

Now, the question is how this should be done. As far as atomic power is concerned, we have a very serious technological problem to solve, or a host of them. The technological problems, being difficult of solution, require gifted technical manpower. We cannot solve these problems by any other device than persuading men of proper training and ability to attack them.

During the war the Manhattan District, and subsequent to the war the Atomic Energy Commission, in weapons work, have followed entirely the method analogous to the one Commissioner Murray advocates, the Government doing everything, and we have been very successful, as you gentlemen probably know. This country is armed as we all hoped it would be and should be. This has been a very successful technique in the field of atomic armaments. But I must point out to you that there is a difference between making atomic weapons and making atomic power piles.

In the matter of atomic weapons, it is obvious to everyone that this is a national need of such overriding importance that patriotism leads people to work. I am afraid patriotism does not lead people to work on our atomic-power problems.

This is the first difference I would point out between the atomic-weapon program and the atomic-power program.

In the atomic-power program, which is a peaceful-uses program, people are not impelled to take lower paying jobs and to forfeit opportunities for careers in which they become better known. Do you realize that some of the most gifted scientists in the world today are entirely unknown because they have spent their time making atomic weapons for the United States? These remarkable things are achievements which if they were described in public would make these men known worldwide. We do not have in atomic power for peaceful uses the patriotic compulsion. Therefore, the method which has been so successful in the weapons program I am afraid will not be so successful in the peaceful-uses program.

Here is another way of saying it. Everything we do is done by contractors, as the chairman said yesterday, with a few minor exceptions. Everything we do is done by letting a contract to somebody. There is a big difference in the peaceful-uses program between letting a contract on a cost-plus-fixed-fee basis, and going into a partnership with a company, or a cooperative, or any other organization. There is a big difference between a cost-plus-fixed-fee contract, and a firm partnership in which the company has its own money and reputation at stake. We will in the cost-plus-fixed-fee arrangement get about what we pay for. I do not in this testimony mean in any way to deprecate the wonderful efforts of our contractors in our production plants. But I would say that my fear is this: Mr. Murray's program is weak in this essential. That the people who take these jobs—and Mr. Murray's program would have to be conducted by contractors working on a cost-plus-fixed-fee basis—would not be led to put their first-string engineers and scientists on the job. I am doubtful about his program because I believe it is not as likely to get the ablest scientists and engineers to work on the problems of atomic power. If we can get the companies to put their own money and their reputations in it, they will get their best men to work on these problems.

This is a point of view which has convinced me. This is the principal reason that I believe we ought first to try the program we are now trying, namely, to encourage industry to become partners with us so we can get the precious manpower that they have. You must realize that practically all the technical manpower is in the employ of private industry. We have to get it from them if we are to get it at all. They are the employers. The question is how can we best do it. I believe we can best do it on a partnership basis.

Mr. Chairman, if this doesn't work, as Admiral Strauss has said, we must go ahead on the other basis for we are under firm compulsion and firm directive—and we have every intention of doing it—to get atomic power as soon as we can. It is just my judgment that we will get it sooner the way we are going than in the way Commissioner Murray suggests. If this does not work, we must switch to some such method.

INSURANCE

Chairman CANNON. I called attention yesterday to statements of something like half a dozen enterpreneurs in which they stated positively that they would risk neither their money nor their prestige under these conditions. What about that situation?

Dr. LIBBY. We certainly need insurance legislation in order to go ahead on this partnership basis. We certainly need it. I do hope the Congress will give it to us.

ST. LOUIS POST-DISPATCH EDITORIAL

Chairman CANNON. Summarizing everything that has been said by the Commissioners here today, and especially in view of your statement that you think the present system is not subject to successful criticism, I would like to read an editorial published a couple of days ago, in the St. Louis Post-Dispatch, one of the great newspapers of the North American Continent. It has an exceptional editorial staff, to the extent that its editorials are accepted as authoritative statements, especially on economic and commercial subjects.

They reach a conclusion which seems to contravene what has been said here about the satisfactory status of the policy you are following. The editorial, dated June 24, 1956, is entitled "Losing the Peaceful Atom," and reads:

> Congress is completing an agonizing reappraisal of an atomic-power policy that has collapsed.

That is a strong statement by a very great newspaper.

Mr. STRAUSS. Mr. Chairman, it is a strong and completely false statement.

Mr. JENSEN. Of course.

Chairman CANNON. It is easy to say it is false or correct. Let it speak for itself.

Mr. JENSEN. I don't care to listen to any more of it.

Chairman CANNON (reading):

> Congress is completing an agonizing reappraisal of an atomic-power policy that has collapsed. It left the development of commercial atomic power up to private enterprise when it enacted the Atomic Energy Act after long debate 2 years ago. Since then the fruits of that policy have been nil. Worse still, there are no firm prospects.

That is a drastic indictment of what you have just praised.

Dr. LIBBY. In my opinion this country leads the world in atomic power, not in kilowatts, but in the solution of the critical technical problems. Don't misunderstand me, Mr. Cannon. We have a long way to go before we have it. But we are ahead. This is my opinion. We are ahead of the Russians and the British, and all of the other countries in the solution of the technical problems which will in the end spell success. We have a long way to go. We should not be too certain about this leadership remaining permanent. But we are ahead right now. That is my opinion.

Chairman CANNON. That is very comforting assurance, and it is an assurance that all of us would like to believe. But there are some very disquieting statements and facts that should be taken into consideration in that connection.

The editorial goes on to demonstrate the truth of its preliminary conclusions. It states there are no firm prospects, and then goes on to say—

> This would not be so bad if the development of atomic electricity were entirely a matter of business and economics.

That is what we were trying to bring out here, that it was not necessarily limited to the development of economical power.

Mr. STRAUSS. Mr. Chairman, on a point of personal privilege, here is an anonymous editorial——

Chairman CANNON. This is an editorial by one of the best known newspapers in the United States.

Mr. TABER. I wonder would the chairman issue a subpena for that great editorial writer so that we might have him here and find out what he knows about it.

Mr. STRAUSS. This is a man who has no responsibility for the project. Here are people before you who are giving their time and full attention to this. If you are disposed to accept obiter dicta, something of this character, you should change the Commissioners.

Chairman CANNON. I am not expressing my own opinion of it. I am presenting it for your comment.

Mr. STRAUSS. I feel badly about it.

Chairman CANNON. It continues:

> This would not be so bad if the development of atomic electricity were entirely a matter of business and economics. It is far more than that. There must be commercially feasible atomic reactors, as yet nonexistent—

Do you agree to that statement?

Mr. STRAUSS. I agree to that statement, and they might equally say there should be interplanetary common carriers and they are nonexistent. It has not been feasible to develop economical power.

Chairman CANNON. We are not discussing here the method of developing economical interplanetary carriers, but we are here discussing the development of economical reactors.

Mr. STRAUSS. Yes, sir. The man is saying something that has not been possible to develop should exist. It is completely illogical to charge the Commission with that.

Mr. ANDERSEN. May I ask that question, Mr. Chairman? What qualifies the gentleman that you are referring to as an expert in this line? I would like to know that before giving his opinion much consideration.

Chairman CANNON. The very fact that he is a member of one of the great editorial staffs of the world which does not employ men who are not qualified. I think the record of this newspaper will stand up on that proposition in every branch of editorial writing.

Mr. STRAUSS. I would like to have the privilege of debating it with him.

Mr. JENSEN. Mr. Chairman, I do not know of any editorial writer who is qualified to take issue with these scientists and great men of the staff of the Atomic Energy Commission to the end that he writes such a critical editorial which is a disservice to America. That is a great disservice to America. The gentleman should be subpenaed to come before the committee and to state his reasons for writing such an editorial. I will make the motion we subpena him.

Chairman CANNON. Here is a man who has a wide audience.

Mr. JENSEN. Yes. So does a radio commentator.

Chairman CANNON. There are few newspapers which have a wider audience.

Mr. JENSEN. It falls flat on the basis of the facts.

Chairman CANNON. We also know that editorial writers not only lead in editorial thought, but they reflect the attitude of a wide circle of readers.

Mr. JENSEN. Mr. Chairman, that editorial is laughing stock to any man in America who uses good common sense.

Chairman CANNON. The statement will be put in the record.

Mr. ANDERSEN. Just one further comment on my part. I am not an attorney as you gentlemen know, but I have heard that nobody is permitted to qualify as an expert before a court—at least this is my superficial knowledge—without that man qualifying himself as such. I would not want this editorial admitted as evidence to which I would give much credence unless I would know how this man is qualified, regardless of how good the newspaper is, Mr. Chairman.

Chairman CANNON. The very fact that he is a member of this editorial staff qualifies him. Furthermore, he is responsible and his paper is responsible if there is any suggestion of slander or libel here.

Mr. TABER. But he is entitled to no weight unless he knows something about it.

Chairman CANNON. The fact that he has written this editorial shows he knows something about it.

Mr. TABER. It sounds like he didn't.

Mr. BOLAND. Mr. Chairman, I would like to know from the people who really ought to know whether or not they believe the program has collapsed.

Chairman CANNON. I am going to ask that question of each of the Commissioners when I have read the article.

Mr. JENSEN. You know the answer, Mr. Chairman, before you read it. It is just wasting time.

Chairman CANNON. The editorial continues:

There must be commercially feasible atomic reactors, as yet nonexistent, before the proposed 12 nation U. N. nuclear power pact can take on any practical meaning. This pact is an outcome of a project initiated by President Eisenhower 3 years ago with the ideal of spreading the benefit of peaceful atomic power worldwide.

In what country will a commercially practicable atomic reactor first be developed? Whatever country it is, it will thus take the leadership of the world in the production of atomic-electric power.

I don't think that statement can be emphasized too strongly.

Are we permitting time to pass here while in other parts of the world other nations, both friendly and inimical, take the lead away from us?

Mr. STRAUSS. I will answer that question, Mr. Chairman, by saying that within a few minutes I will have down here some photographs large enough for everyone to see them, to show you a "collapsed" atomic power program. I will show you plants building, the present state of construction as of 2 or 3 weeks ago, and you will be able to see for yourself the extent to which it has collapsed.

I would like to call your attention, and that of the writer of that editorial, to the fact that there were no commercial powerplants built or in prospect 3 years ago.

Chairman CANNON. Proceeding with the editorial:

> Other countries will look to it for their reactors.

That is, any country that leads the world in the production of atomic electric power.

> If the world market for atomic reactors were lost to the Soviet Union it would be a catastrophe to the free world, a member of the Atomic Energy Commission, Dr. Willard Libby, warned 3 months ago.

The editorial quoted a member of the Atomic Energy Commission.

Mr. STRAUSS. They have a habit of quoting out of context frequently. I would like to know what the quotation is.

Chairman CANNON. Quoting further from the editorial:

> If the world market for atomic reactors were lost to the Soviet Union it would be a catastrophe to the free world, a member of the Atomic Energy Commission, Dr. Willard Libby, warned 3 months ago.

Is that true, Doctor?

Dr. LIBBY. That is true. I said that and I believe that. But I think we are in no way near such a catastrophe. It seems to me that at Geneva last summer—I don't know whether any of the members of this distinguished committee were there—where we had a conference devoted very largely to atomic power, of all of the papers and materials presented, by far the largest contribution of any nation was made by the United States. There were 54 nations participating in that conference. We are well ahead in development of power reactors. I want to say that it is difficult to measure progress in this field because the problems are subtle technical problems.

I would point out to you, Mr. Cannon, and members of the committee, that it is only the United States that at the moment has made substantial quantities of fuel available for the international atomic-power program. That is not saying the other countries won't. But to date we are the only ones who have made substantial quantities of fuel available.

Chairman CANNON. The editor discusses that a little later.

Dr. LIBBY. We are in a position with our varied attack to come up with the economical powerplant sooner than those countries who have a narrower approach. One could say that they might guess right. This is a dangerous business, and it is a technical judgment as to whether they have guessed right. I believe that our program will come up with the answer sooner than that of any other country. The only thing that could stop us would be for our partnerships with industry to fall down. They have not fallen down. They have gone

along very well in my opinion, and I have every hope that we will succeed.

Chairman CANNON. Half a dozen of them said in their statements that they were stopping right now and do not propose to risk their money and prestige under present conditions.

Mr. JENSEN. I never heard of anything of the sort.

Dr. LIBBY. We have to have insurance.

Chairman CANNON. So unless something is done on that score we are not making any progress at all.

Mr. JENSEN. Mr. Chairman, let us have the facts. You know full well that a half dozen men in private utilities have made no such statement as that. Let us be fair on this thing.

Chairman CANNON. Continuing——

Mr. JENSEN. Enough is enough.

Chairman CANNON. I might say here that the gentleman from Michigan, Mr. Rabaut, just now interpolated that this particular newspaper was the first to call attention to the Dixon-Yates program, and everything that it charged about the Dixon-Yates program was proved to be true, and the Dixon-Yates program was repudiated.

Mr. PHILLIPS. May we have time on the record to correct that statement?

RUSSIAN PROGRAM

Chairman CANNON. Certainly. [Continuing.]

Meanwhile, the Soviet Union has announced a commercial-scale atomic power-plant to be put into operation this year.

Admiral Strauss has said he wouldn't believe anything that came from the Soviet, but the Defense Department has said that when the Soviet Union has announced progress and announced it had certain planes, it subsequently developed that they did have them.

Mr. JENSEN. So you believe everything the Russians say.

Chairman CANNON. The Department said subsequently that it developed they did have them. It made that statement in connection with a recent announcement by the Soviet Union in which they made certain claims of progress with reference to the missile program.

Mr. STRAUSS. Mr. Chairman, since you quoted me, might I amplify? I do not wish to have the record to indicate that I disbelieve everything that they say. I do not necessarily believe everything that they say because most of the statements that are made by the Russians are made for the purposes of influencing the hearer. I think most of us will recall that a number of years ago, 8 or 9 years ago, they announced that they had developed atomic energy and they were developing it for peaceful purposes, and that they were using it to change the courses of rivers and move mountains. We know that is sheer balderdash. I suspect that some of the things that they say they are doing in our field may be correct, but it is not necessarily true because they announce it. With that correction on this record, I will let it stand.

Chairman CANNON. Admiral Strauss made this statement in a speech in Cleveland on December 14, 1955:

Last month (November 1955) in Moscow, on the anniversary of the Red Revolution, the Soviet Union's Deputy Premier, Kaganovich, had this to say: "Only by a rapid and extensive introduction of the most up-to-date achievements of domestic and foreign science and technology shall we be able to reach a

high productivity, compared with capitalism, which is indispensable for the victory of communism."

That is the end of the quotation. Then Admiral Strauss goes on to say:

Do not miss the impact of these last four words "the victory of communism." Victory for communism; if it is attained, is defeat for freedom.

What Soviet spokesmen are saying, in effect, is that the Soviets mean to bring about the victory of communism through the adoption of the very means by which our own greatness was achieved—the vigorous encouragement of science and the development of technology for use in Russia and for export abroad. They adopt the body, of course, without the spirit. Only time will tell if it can so operate.

End of the quotation.

Mr. STRAUSS. If your research people, Mr. Chairman, will provide you with the entire body of that speech, you will see that it was directed toward the Russian development of scientific education, which, by comparison with our own, indicates the great desirability of accelerating the numbers of graduates in science and engineering professions that we are turning out.

Chairman CANNON. That is a part of the whole problem.

Mr. STRAUSS. That is right.

Chairman CANNON. That is what we are discussing.

Mr. STRAUSS. Yes.

NUCLEAR POWER PROGRAMS OF OTHER COUNTRIES

Chairman CANNON. The editorial continues:

Meanwhile, the Soviet Union has announced a commercial-scale atomic power-plant to be put into operation this year. Great Britain will place its first large atomic powerplant in operation in October. France expects to have its first large reactor running next year. Not a single commercial-scale atomic power-plant is being built in the United States by private enterprise, which insisted so vociferously 2 years ago, and with such glowing promises, that the job should be left up to it. There is not even any such plant directly in sight. The only large reactor going up in this country is Government-financed. It is expected to be completed about the same time as the French reactor.

I take for granted that statement of the program of foreign nations, Russia, France, and England, as far as we can see now, is fairly accurate?

Mr. STRAUSS. No, sir; it is not fairly accurate. The British reactor referred to is not a power reactor. The Chairman of the British Atomic Energy Authority, who was here less than a month and a half ago, described it for the press as a weapons material producing reactor of which power is a byproduct. Their first civilian power reactor will not even have orders placed for it by this autumn by his own statement. I have a recording of that. This is as nearly as possible a quotation from it.

I don't know anything about the Russian program except that in Geneva in August of last year they described to us a reactor—what was the size of it, Dr. Libby—100,000 kilowatts, to which they have not subsequently referred. When questions are asked about it, they brush them aside. That is a projected reactor. Whether they have gone beyond that point or whether they have not achieved it, I don't know. The only reactor we know that the Russians have at the present time is the 5,000-kilowatt reactor, which, Mr. Chairman, you discussed a little earlier this morning.

Chairman CANNON. In this connection, Mr. Davis, who is sitting at the table here with us, said at Des Moines, on October 10, 1955:

Unquestionably there are technological areas where other countries, particularly the United Kingdom and the U. S. S. R., are ahead of the United States.

"Unquestionably," he says.

Mr. STRAUSS. He was not speaking of reactors, Mr. Chairman. Would you describe what areas you were speaking about there?

Chairman CANNON. We are discussing the whole subject matter. Russia is evidently making progress. Mr. Davis said:

Unquestionably, there are technological areas where other countries, particularly the United Kingdom and the U. S. S. R., are ahead of the United States. However, the number and extent of these areas are small compared with the areas where we are ahead.

But in some respects they are ahead.

Then Mr. Davis goes on and makes this statement:

Another reason for not being complacent is that the United Kingdom, the Federal German Republic, and Russia do not have as far to go as we to attain economically useful nuclear power because they do not have nearly so large reserves of cheap fuels as the United States. This situation may lead to widespread utilization of atomic power in other countries, with consequent improvement, at an earlier stage than in our country, even though we may be ahead technically.

Mr. Davis also said two months after he made the statement at Des Moines:

The Russian papers on physics and other fields of basic science indicated a high level of competence.

The editorial continues:

In this dilemma—

the dilemma in which we find ourselves today as a result of the rapid progress made by other nations and as the writer says, the collapse of our own policies—

In this dilemma of our Nation—and of the entire free world—

I don't think anything can be more significant and more important. Any suggestion we have on it by anybody who is in a position to give us any light should be very carefully considered. The need is so great, the danger is so acute.

In this dilemma of our Nation—and of the entire free world—Senator Gore of Tennessee has been doing the same kind of statesmanlike yeoman work that Senator Douglas of Illinois did earlier on the natural-gas issue. He has introduced a bill for the construction of six commercial-scale atomic reactors by a combination of private and Federal enterprise.

That is the partnership to which you referred, I take it, Dr. Libby?

Dr. LIBBY. When I said partnership, Mr. Chairman, I had in mind the kind of relations we have developed with various groups of companies in our power demonstration reactor program where they put their money and their substance and their reputation into it, rather than an arrangement where we pay the cost plus a small fee. I used the word "partnership" for the first type of relation, rather than for the second. Of course, in the second kind of relation there is a kind of partnership, especially in weapons work. In weapons work our contractors are wonderful. The leadership we have in the world today is in large measure due to the excellent quality of the work the contractors do on this patriotic endeavor.

My worry is, sir, that it won't work in a peacetime program. That is my worry.

Chairman CANNON. The task is so great, he says, that the labors of all will be required.

On this plan,

> Why does not the sound sense of this approach commend itself to all Members of Congress? It has been shown that private enterprise alone cannot—

and I think we agreed here that there would have to be some things the Federal Government would have to do—indeed Senator Gore says in fairness to its investors it should not—carry out so tremendous and speculative a venture.

> That the venture should and must be pushed to success is generally recognized. Standing in the way are only a prejudice and a fear. A prejudice against participation by the Federal Government in the development of any kind of electric energy, atomic or otherwise—a fear of an atomic TVA.
>
> To allay this fear Commissioner Thomas E. Murray, of the AEC, has proposed that the reactors should be placed at the Commission's production plants to supply them with power, "thus eliminating the issue of public versus private power."

I would say that is a consummation devoutly to be wished.

> But whether or not some such compromise is agreed upon, the counsels of inaction cannot long continue to be allowed to prevail.
>
> As Senator Potter, of Michigan, has observed in the Senate debate, the very industrial survival of the United States may depend upon what is done toward putting atomic energy to work now. It is not pleasant to contemplate the possibility that, as inventive ingenuity progressively lowers the cost of atomic power, this country may find itself unable to hold its own in power costs with competing industrial countries. But we must realize that we have marked far too much time already.

There is just one sentence here that I would like to emphasize.

> The task is so great that the labors of all will be required.

That concludes the editorial.

I thought one of the finest of many fine statements made yesterday by those who appeared before the committee was that this is not a political question and it should not be discussed from a political point of view. Politics should not be allowed to interfere. It is too serious a matter. National survival and national prosperity depend on it.

And may I say, gentlemen, I hope you will not attribute any political connotation to any statement I have made here. I have no partisan prejudice on this subject. It is too important a matter, it is too desperate a crisis to admit of partisan complications.

Mr. JENSEN. Mr. Chairman.

Chairman CANNON. The gentleman from Iowa.

VIEWS OF CONGRESSMAN JENSEN

Mr. JENSEN. I wonder if we should not summarize the situation, as it exists now. The Atomic Energy Commission and its staff and private industry, and all who have been a party in the development of the A-bomb, have made great strides in that field. We know what has been done, and it has been wonderful in the sense of the progress that has been made. It is a scary thing to talk about atomic energy and atomic bombs and the dropping of bombs on human beings.

I for one wish that the bomb had never been dropped out in the

Pacific. I hope a bomb is never dropped again on human beings. But we must be prepared.

Now, we are having this hearing, and a lot of people are talking about power from atomic energy. Just how terribly important it is to embark on a "crash" program. Let us take a look at it. We have in America the greatest electrical power production of any nation in the world many times over. How have we attained that production? By the partnership program where the Government builds hydroelectric plants producing power and that power is distributed to prefered customers, public bodies and others according to law. We have private utilities that are producing power no end. We have REA's doing the same thing. We have public power districts in some States doing the same thing and all together, they are working wonderfully well together, generally speaking, except in a few places.

Here are these very able gentlemen, the Commissioners of the Atomic Energy Commission, their very able staff, and many other great scientists in the field of atomic power who are working together going along at a pace that is possibly not as expeditious as some people would like to have it, but in America we, as I said, have a great power development already in existence.

Here we are working on the generation of electric power from atomic energy. I don't think it is so necessary, owing to the fact that we have sufficient power in America today in the conventional type power producing program, to jump head over heels into a field of atomic energy.

I am anxious to go as fast as we can. But it is not a world-shaking problem. There is no one who criticized you folks that I know of because you had failed to develop the atomic bomb—either the A-bomb or any other one—which is the thing that pertains to national defense. We know that we have the building of great hydroelectric powerplants in the offing. Private utilities are building great steam plants. REA's are building steam plants. They are keeping abreast of the power need. We can build electric powerplants pretty fast in time of emergency. I can't quite see why we are going into all of this criticism of the progress made by the Atomic Energy Commission in the field of reactors at this time.

I know that the Atomic Energy Commission, while there is a little difference of opinion between you gentlemen as to just what course should be taken, is working on this problem. It shows your individual independence. I hope that the difference is not so great that it will affect the progress and the program. I am sure you gentlemen are not going to let it get to that point.

When we start reading editorials from papers like the chairman has done, where an editorial writer sets himself up as a great atomic expert, and these other editorials that the chairman has read where private industry said if the private industry left a void, the Atomic Energy Commission would step in and fill that void——

Chairman CANNON. Without objection the subcommittee will stand in recess until 2 o'clock this afternoon. The Committee on Appropriations will assemble immediately.

AFTER RECESS

CHRISTIAN SCIENCE MONITOR EDITORIAL

Chairman CANNON. The committee will be in order.

Continuing our hearing of this morning, I will also insert in the record another editorial along the same line as that inserted this morning. The one this morning was from St. Louis in the Central West. This editorial is from the eastern seaboard—the Christian Science Monitor, a national newspaper published at Boston.

The editorial reads:

There is a possibility that atomic bombs will never be used in war, but there is every possibility that the peaceful uses of atomic energy will shape the next half century. Wisely the American people are insisting that their development of the atom for defense shall be second to none. Would they not be wise to exert equal pressure to insure that their country shall keep pace in the competitive development of atomic power for peaceful uses? There is more evidence that it is falling behind in this field than in the military uses. Two years ago Congress enacted useful legislation to facilitate private industry's building atomic power-plants, but many difficulties have beset them in building reactors, including the security regulations and the problem of insurance. While the Atomic Energy Commission is said to have proposals from five firms or groups for power projects, these are still on paper. The only reactor under construction is that being built by the Government at Shippingport, Pa.

Meanwhile both the Soviet Union and Great Britain are reported moving ahead rapidly. The Russians have been sending around the world a film showing operation of a small atomic power plant they say has been working since 1954. The British will begin delivering power from their first commercial atomic plant this year. Both nations have programs far outstripping that of the United States. Americans aware of the situation have become seriously concerned. They feel that faster development and wider experience with the various types of reactors will give the Soviet and Britain more know-how and a definite advantage in world competition. There are areas and nations in various corners of the earth lacking in other power sources which are hungry for the peaceful atom. When seeking to buy reactors, they will go to those who have shown most progress in developing and operating them. How can the United States compete effectively? Senator Gore offers one answer. It is contained in his bill to have the Government build six reactors in a crash program. He has performed a very useful service in publicizing the situation and his proposal warrants earnest consideration. It could well produce quicker results than are promised by the present program. Senator Anderson, head of the joint congressional committee, suggests that to be most effective the reactors should be built abroad. This would have two advantages. They might be built in areas where the high cost for power would be less of a commercial handicap, and they would be wonderful on-the-spot showcases for American merchants of economy power equipment. One drawback would be the potentially discouraging effect on private industry. Its enterprises and resources can make a great contribution. A start has to be made toward enlisting them.

In this field neither the ordinary incentives of capital nor the ordinary freedom of capital can operate. Probably government will remain the senior partner, but it is important that the junior partner be encouraged. We trust that this can be done even while meeting the challenge of the peaceful atomic contribution.

APPREHENSION THAT UNITED STATES PROGRAM IS MOVING TOO SLOW

These two editorials indicate deep concern lest America be outstripped in the race to develop atomic power.

Beginning with Dr. Libby, may I ask, Dr. Libby, what justification, if any, do you think there is for concern? I will say I have not looked for these editorials. Doubtless a search through the newspaper

files upstairs would show others of like tenor. I have merely presented the two which were handed to me.

Dr. LIBBY. I wouldn't say that the fears are groundless. As I said hension expressed in these two editorials, and what are we doing to remedy the situation?

Mr. LIBBY. I wouldn't say that the fears are groundless. As I said this morning, we are ahead now, sir, but this doesn't guarantee that we will stay ahead.

The two countries mentioned have strong technical corps and they are working hard. We are working hard. I think we will stay ahead. But we are ahead at the moment, in this sense, that the problem is to obtain economical atomic power eventually. Both Britain and Russia may build more kilowatts of generating capacity than we build, but I don't see the problem as one of producing atomic-power kilowatts. I see it as one of solving the technical problems to get cheap kilowatts.

We have a very varied program, and I think if we can stay with it and pursue it, and use our manpower on it until we discover the one or two lines which are most likely to prove eventually to be economical, we will keep ahead in this race.

So perhaps the point is that this is a difficult thing for people who are not right in the program to see. It is difficult to see the progress being made in the research laboratory on a small powerplant, and to evaluate it. It is easier to see a full-scale plant as proving the practicality of a given approach. But I don't believe that the engineers involved would say that most of the problems are solved in the large-scale plants. Many are. We can't do anything in the way of building a reactor without learning something.

Please don't misunderstand me on that point. Every time we build a reactor we learn something. The problem is conservation of our manpower resources, and to use them where they will do the most good in coming finally to victory in this peaceful competition, namely, to obtain economical atomic power.

So I think the point of these editorials is that the people are anxious, and I think it is wonderful they are concerned, and they want us to get ahead. It shows the people do understand the importance of our staying ahead in this and are solidly behind the effort to get ahead. I think the efforts they indicate may possibly show that they do not know about the technical aspects of the program as much as they should. That may be in part our fault. We have tried to explain our program in considerable detail. Every year we have the section 202 hearings before the joint committee, and we do quite a bit of trying to explain it. We have an access-agreement program that makes technical information available to people on the basis of an appropriate security clearance, because some of it is classified at the present time. But we try to disseminate it.

At the Geneva Conference we made an enormous amount of information available on atomic power. So I think we have tried pretty hard to tell people what the situation is. However, it is new and a difficult field to understand. One can understand where every screw goes in a reactor, and yet when you stand near the *Nautilus* reactor and realize that this silent little structure is propelling this giant boat, you learn for the first time that atomic power really does exist and really is

here. You may know everything there is to know about it technically, but there is a new realization in the actual experience of operating an atomic powerplant.

In general, however, the fundamental difficulties and problems are solved before you get to the full-scale plant. The main proportion of them are. There are some that will not be. But the technical problems are in general met and faced before the full-scale prototype is built.

CONTINUANCE VERSUS CHANGE IN PRESENT NATIONAL POLICY

Chairman CANNON. The question here seems to resolve itself to a matter of national policy, the adequacy of the policy and the effectiveness with which it is being administered. Would you advocate a change in policy or a more effective administration of the policy as it is?

Dr. LIBBY. I would like to have us continue on the present policy, which I would state as follows: We conduct a vigorous research and development program, and whenever we see a chance to build a full-scale prototype profitably, we go ahead, trying first to get one of the partnership arrangements I was describing this morning in order to get the best technical people available working on the program. If this fails, the Government should go ahead with the prototype on a contractual basis.

Chairman CANNON. Commissioner Vance.

Mr. VANCE. I think Dr. Libby has expressed my ideas, sir.

Chairman CANNON. Commissioner Murray.

COMMISSIONER MURRAY'S VIEWS

Mr. THOMAS E. MURRAY. I will just undoubtedly be repeating what I have already said, but one thought just occurred to me while Dr. Libby was talking. That is the fact that the difficulty in the problem that we are facing, and the reason for such editorials as you have read here today, is the fact that I believe atomic power has been oversold. I don't know whether it is a billion or hundreds of millions of people around the world who have been given the idea, rightly or wrongly, that this atomic power situation is something that is just around the corner. To them it may appear that for some reason or other the United States is holding back and not willing to give the benefits of atomic power to the rest of the world. That is just one thought I would leave with you.

Another thought that I expressed before, as Chairman Strauss has expressed many times, is that it is extremely difficult to try to appraise what the other countries are doing in this field. Public announcements and whatnot are things that you just can't take at face value.

Chairman CANNON. There seems to be at times an effort—and that is true especially in recent weeks of the Russian program—to impress the world with the fact that the U. S. S. R. is open and aboveboard, asking representatives of other nations to come in and inspect their planes and plants. I take for granted that in both England and France also there is a disposition to collaborate—and in fact a definite pact between England and the United States to cooperate with each other in this work.

Mr. THOMAS E. MURRAY. There should be some very concrete way to find how far the United Kingdom has progressed in this business. I think everybody will admit that the Russians have the capability of doing the things that they say they intend to do scientifically. I suppose from a manufacturing standpoint, if they say they will build a 100,000-kilowatt plant, I am willing to make the judgment that they have the capability to do that. But as I said yesterday, I don't think that our program ought to be based just on the theory that we have to keep up with the Russians, or try to keep ahead of the Russians. I think our action should be a unilateral action. I don't think there is any question that in 1953 when the President made his famous speech at the United Nations, which was a marvelous address, that he made definite promises to friendly nations that we would bring the advantages of peaceful atomic energy developments to all the friendly nations of the world.

As I say, I keep repeating myself. It is all a matter of time. How soon do you intend to do this? We have made a very generous move in allocating 20,000 kilograms of fissionable material for this country, and 20,000 kilograms of fissionable material for foreign use. How is that material going to be used? When is it going to be used? When will we be in a positon to use that material?

So it is all a matter of approach, whether one thinks this program is moving fast enough under what we are doing today. We have had a good deal of experience in many, many areas. We are doing a tremendous amount of research in our national laboratories. I think we can do more. I think we should do more.

Chairman CANNON. Do you think there is any reason for modification of our policy or for any variation in the administration of our policy at this time? That seems rather basic in all of these discussions.

Mr. THOMAS E. MURRAY. I think as you know, Mr. Chairman, and as I put it in the record this morning, I am recommending a program of building 4 or 5 of these large nuclear reactors, and that we do it, not on a crash basis, but on a Government-supported basis. I think industry can be brought in. I think the question of manpower is one that will be solved as you move along into this program.

PRIVATE AND GOVERNMENT FINANCED PROGRAMS

Chairman CANNON. In the study of the Government's endeavors to develop commercial nuclear powerplants, we have been made acquainted with three different programs. I would like to ask you about those programs. I take it for granted that program and policy are largely synonymous. There is the Government's experimental program. There is the power demonstration program, and the independent industrial program. Will you differentiate between those and tell us just how they fit in at this point?

Mr. THOMAS E. MURRAY. I don't quite understand the difference between the second and the third programs.

Chairman CANNON. The second one is the power demonstration program. There is the Yankee Atomic Electric Co. There is the industrial program with the Consolidated Edison Co. in New York.

Mr. THOMAS E. MURRAY. I have never considered that as a essentially different kind of program.

Chairman CANNON. They are handed to us in this printed form.

Mr. THOMAS E. MURRAY. The difference is that the Consolidated Edison program is completely privately financed. The other programs that you mentioned are privately financed, but receive some measure of Government assistance.

You realize that one of the great difficulties with this procedure of allowing private industry to take over a certain area of activity—we will say the pressurized water or the homogeneous field or whatever field you might mention—is that we retain no control over that particular program.

What I mean by control is that we have no say as to when that program is to start. We have no assurance when it will be finished. We have no guaranties that it will ever be finished. We are relying on private industry to use its best judgment and its best efforts to go ahead in particular areas. That is one field of endeavor. The experimental program which you mentioned is a program we are carrying on in small-scale reactors at our various sites. That is a very good program. It is a program that should be encouraged and should perhaps be enlarged upon.

On top of all of these, I think we can do some more. I think we can get the answers to economical power much more quickly if we determine that we need these answers more quickly.

PRESSURIZED-WATER SYSTEM

Chairman CANNON. You mentioned the pressurized-water system. The *Nautilus*, as I understand, is equipped with a pressurized-water system.

Mr. THOMAS E. MURRAY. Yes, sir.

Chairman CANNON. Has your experience with the *Nautilus* demonstrated the feasibility of using the pressurized-water system specifically in the development of commercial power?

Mr. THOMAS E. MURRAY. Now, if you said economical power, I would have to answer not yet; that is, for economic power in this country.

Chairman CANNON. By that you mean it is too costly?

Mr. THOMAS E. MURRAY. It is too costly, at present, to be economic in this country.

Chairman CANNON. Can you see ahead of you any possibility of its being made more practical?

Mr. THOMAS E. MURRAY. It is one avenue that perhaps might eventually prove to be an economical approach to this problem.

Chairman CANNON. That is the system being used at Shippingport, Pa.?

Mr. THOMAS E. MURRAY. That is right.

Chairman CANNON. The reactor at Shippingport, Pa., is the only one at this time in any advanced stage of construction. Was that system selected because it seemed as a result of your experiments with the *Nautilus* the most practical?

Mr. THOMAS E. MURRAY. It seemed the one that was nearest to completion. It seemed to be the one that was furthest along in the development stage. It believe it might be helpful, Mr. Chairman, if you wanted any discussion about the *Nautilus* and its performance, to call on Admiral Rickover who has been responsible for the whole program. I would rather have you direct any questions you might have to him, with your permission. The primary reason why the pressurized-water system was selected in 1953 for Shippingport was that we considered it was the furthest along the road.

NEED FOR FEDERAL ASSISTANCE TO MOVE PROGRAM FORWARD EXPEDITIOUSLY

Chairman CANNON. Might I ask you then, Commissioner Murray, about the following statements made by Mr. Davis at Des Moines, last October? For instance, Mr. Davis said:

> The plain fact is that today we do not know how to do many of these things required for economically competitive power in the United States.

Mr. PHILLIPS. To whom was the question directed?

Chairman CANNON. I am talking to Mr. Murray, who has been discussing it:

> We have no shortage of ideas among scientists and engineers on solving the problem. They can predict what the situation will be like if the problems are solved, but that does not save them time-consuming and difficult tasks of actually solving the problems. They are bound to be unsuccessful in some efforts and will have to seek other solutions in some instances.

What would you say about that statement?

Mr. THOMAS E. MURRAY. I think it is a pretty good statement by the head of our Reactor Development Division. There are lots of problems that have to be solved.

Chairman CANNON. He says in effect here that you are certain to meet failure in some instances and you should expect to meet success in some.

Mr. THOMAS E. MURRAY. That is correct.

Chairman CANNON. What about the percentage of failure and the percentage of success, and what can be done to increase the percentage of success?

Mr. THOMAS E. MURRAY. I can't give you a judgment on the chances of success and failure. That is the reason why private industry cannot jump in and move forward as expeditiously as we would like them to move forward.

Chairman CANNON. Inevitably you must have collaboration by the Government.

Mr. THOMAS E. MURRAY. Therefore, we are liable, under any plan I suggest or anybody else suggests, to build a large reactor that might be a failure.

Chairman CANNON. What should be the nature and the ratio of Federal cooperation?

Mr. THOMAS E. MURRAY. I think that the Federal Government should take over 4 or 5 different promising avenues and do those particular jobs. The most promising avenues to pursue would first have to be determined by the Commission.

Chairman CANNON. You think there is no one else who can do it as effectively?

IMPORTANCE OF TIMING

Mr. THOMAS E. MURRAY. If you have the time, I say private industry can do it just as effectively. There is no question about that.

Chairman CANNON. As was said this morning, time is of the essence. In both of these editorials the apprehension seems to be that time is short and we are being outstripped by our competitors, both friends and foes, so we are dealing with a proposition in which time is a very vital factor. That being true, what would you advise?

Mr. THOMAS E. MURRAY. My answer is that we ought to get ahead with it. Not only on the basis, Mr. Chairman, that we may be behind in building reactors, but because in this whole problem of nuclear power and atomic weapons with their threat to the survival of mankind, all of these things have to be put in the hopper and weighed. You have to say to yourself, "What am I going to do about this?" One must try to go ahead with disarmament programs on the one hand, that is, try to reach agreements with certain parties for the limitation of armaments, and other things. Over on the other hand you should be doing things in peaceful applications just as fast as you possibly can.

There is a discussion and argument here today that maybe you don't have the manpower, maybe you don't have the facilities to go ahead and do these other things and build these other 4 or 5 reactors without interfering materially with other programs. I question that.

Chairman CANNON. You think that we do have the necessary know-how?

Mr. THOMAS E. MURRAY. I don't say that we have the know-how now, but I say as the program develops you will develop the manpower and the facilities to do these jobs.

Chairman CANNON. The way to do this thing is by doing it.

Mr. THOMAS E. MURRAY. I think that is the best way to sum it up. That is what we did in the case of the PWR. We could argue from now to doomsday whether the PWR at Shippingport should be built. If we could review that whole history you could get all sorts and kinds of arguments why you should not build it. But today that is the only plant we are bragging about. That is the only plant we are bragging about that will produce 60,000 or 100,000 kilowatts of power at the end of next year. It is going to be expensive power.

Chairman CANNON. We must expect that.

Mr. THOMAS E. MURRAY. Of course. We knew it at the very beginning. But we said the second core you put in will be more efficient than the first core and maybe the third core will be much more efficient than the second core. Then you reach a conclusion that there is a limit. If you project such improvements, you could possibly say that the present Shippingport reactor has a possibility of reaching economical power. Private industry could not afford to do that unless they could deduct the cost from income which did not cost them anything.

Chairman CANNON. Which is hardly practical.

Mr. THOMAS E. MURRAY. They could not do it. They could not justify such a project to their stockholders.

Chairman CANNON. You said just now, Mr. Murray, that we ought to get ahead with it. How shall we get ahead with it? What shall we do that we are not doing now in order to get ahead with it?

Mr. THOMAS E. MURRAY. We should build 4 or 5 of these different types of reactors. The Government should move into the business of building 4 or 5 of these different reactors.

Chairman CANNON. The quicker we start that program, the quicker we start toward the solution of the problem.

Mr. THOMAS E. MURRAY. I think so.

CONTRACTS FOR REACTORS

Mr. TABER. I wonder, Mr. Chairman, if we could not have a picture of just what contracts have been let, to whom they have been let, and how, and when the effort with reference to these reactors individually is coming to an end, and what it is proposed by Mr. Murray to be done in addition to that.

I would like to see something like that so that we could get a good picture of this thing.

Chairman CANNON. We will ask you to put in the record at this point the information in tabulated form requested by Mr. Taber. Counsel reminds me that we have it here in chart No. 11.

Mr. TABER. It is not as clear as it might be as to a lot of these things.

Chairman CANNON. Will you indicate the additional information required and we will have it put in the record at this point.

Mr. PHILLIPS. I am not sure, Mr. Chairman, that the table gives the information exactly as Mr. Taber asked.

Chairman CANNON. I suggest, Mr. Phillips, that you supplement it with any questions which you think would supply the information that is needed, and we will put it all in the record at this point so, as Mr. Taber says, we will have the whole picture before us.

(The information is as follows:)

CHART XI.—*Developing civilian atomic power*

Government's experimental program	Scheduled for operation	Power demonstration program	Scheduled for operation	Independent industrial program	Scheduled for operation
		FIRST ROUND			
Shippingport, Pa., pressurized water reactor, 60,000 kilowatts, Westinghouse and Duquesne for AEC.	1957	Rowe, Mass., pressurized water reactor, 134,000 kilowatts, Yankee Atomic Electric Co.	1960	Indian Point, N. Y., pressurized water reactor, 140,000 kilowatts, Consolidated Edison Co.	1960
Lemont, Ill., experimental boiling water reactor, 5,000 kilowatts, Argonne National Laboratory.	1957	Monroe, Mich., fast breeder reactor, 100,000 kilowatts, Power Reactor Development Co., Inc. (Detroit Edison Co. and others).	1960	Dresden, Ill., boiling water reactor, 180,000 kilowatts, Commonwealth Edison Co. and others.	1960
National Reactor Testing Station, expermental breeder reactor No. 2, 17,500 kilowatts, Argonne National Laboratory.	1959	Nebraska, sodium graphite reactor, 75,000 kilowatts, Consumers Public Power District.	1959	Eastern Pennsylvania, aqueous homogeneous reactor, 150,000 kilowatts, Pennsylvania Power & Light Co.	1962
Santa Susana, Calif., sodium reactorexperiment, 7,500 kilowatts, North American Aviation for AEC and Southern California Edison Co.[1]	1957			Florida (type unspecified), 200,000 kilowatts, Florida Power Corp., Florida Power & Light Co., Tampa Electric Co.	1962
		SECOND ROUND			
Oak Ridge, Tenn., homogeneous reactor experiment No. 2, no electricity, Oak Ridge National Laboratory.	1956	Elk River, Minn., boiling-water reactor, 22,000 kilowatts, Rural Cooperative Power Association.	1960	Livermore, Calif., boiling water reactor, 3,000 kilowatts, General Electric Co. and Pacific Gas & Electric Co.	1957
National Reactor Testing Station, organic moderated reactor experiment, North American Aviation for AEC (no electricity).	1957	Gainesville, Fla., pressurized water reactor, 500 kilowatts, University of Florida.	1959		
Los Alamos, N. Mex., molten plutonium reactor experiment, Los Alamos Scientific Laboratory (no electricity).	1959	Piqua, Ohio, organic moderated reactor, 12,500 kilowatts, city of Piqua.	1961		
Los Alamos, N. Mex., power reactor experiment I and II, Los Alamos Scientific Laboratory (no electricity).	1956	Hersey, Mich., aqueous homogeneous reactor, 10,000 kilowatts, Wolverine Electric Cooperative.	1959		
Liquid metal fuel reactor, the Babcock & Wilcox Co.	1959	Anchorage, Alaska, sodium cooled-heavy water moderated, 10,000 kilowatts, Chugach Electric Association, Inc., Nuclear Development Corporation of America.	1962		
Gas cooled reactor (contractor not selected).	(2)	Orlando, Fla., liquid metal fueled reactor, 25,000 to 40,000 kilowatts, city of Orlando.	1961		
		Holyoke, Mass., gas cooled reactor, 15,000 kilowatts, city of Holyoke.	1961		

[1] Turbogenerator and other conventional electric transmission equipment.
[2] Unknown.

ESTIMATED PROGRAM TOTALS

[In millions]

Estimated cost of all work from July 1, 1953, through completion of projects listed. Includes cost of core fabrication but excludes cost of special nuclear materials. Excludes EBR-1, HRE-1, and borax-1, 2, and 3:		Based on proposals submitted to AEC. Excludes cost of core fabrication and of special nuclear material:		Based in part on statements made by sponsoring utilities and in part on AEC estimates:	
Government	$236	Government	$77	Government	0
Industry	20	Industry	128	Industry	$210

	Kilowatts		
Total electrical capacity	1,182,000	Total estimated cost	$671,000,000
Government's experimental program	90,000	Government	313,000,000
Power demonstration program	419,000	Industry	358,000,000
Independent industrial program	673,000		

TABLE II

Summary of large prototype power reactor plants proposed, part 1 (power demonstration reactor program projects and others)

Company	Westinghouse [1] and Duquesne Light Co.	Yankee Atomic Electric Co.	Consolidated Edison Co.	Commonwealth Edison and others	Consumers Public Power District	Power Reactor Development Co. (Detroit Edison, et al)	Westinghouse and Pennsylvania Power & Light
Location	Shippingport, Pa.	Rowe, Mass.	Indian Point, N. Y.	Dresden, Ill.	Beatrice, Nebr.	Monroe, Mich.	Pennsylvania Power & Light service area.
Type of reactor	Pressurized water (PWR).	Pressurized water.	Pressurized water	Boiling water.	Sodium-graphite.	Fast breeder.	Aqueous homogeneous.
Thermal power	236,000 kw	480,000 kw	500,000 kw	630,000 kw	245,000 kw	300,000 kw	Not available.
Gross generating capacity	100,000 kw	134,000 kw	250,000 kw [2]	180,000 kw	75,000 kw	100,000 kw	150,000 kw.
Amount of fuel	12 T natural U and 52 kg about 90 percent.	28,800 kg 2.5 percent.	275 kg U and 8275 kg th. About 90 percent for U.	68,000 kg 1.1 percent.	22,500 kg 2.3 percent.	2,100 kg 27 percent.	Not available. Do.
Enrichment percent U-235							
Moderator	H_2O	H_2O	H_2O	H_2O	Graphite	None	Do.
Coolant	H_2O	H_2O	H_2O	H_2O	Sodium	Sodium	Fuel solution.
Reactor temperature [3]	540° F	535° F	510° F	480° F	925° F	800° F	Not available.
Reactor pressure	2,000 psig	2,000 psig	1,500 psig	1,000 psig	46 psia	Atmospheric	Do.
Steam conditions	585 psig saturated	600 psig saturated	370 psia saturated 1,000° F.	970 psia 540° F.	800 psia 825° F.	600 psia 730° F.	600 psia.
Estimated cost of reactor [4]	$37,750,000	$18,500,000	Not available	$34,200,000	$13,500,000	$36,000,000	Not available.
Estimated cost of turbogenerating plant.	$10,000,000	$16,000,000	do	$10,800,000	$10,800,000	$9,000,000	Do.
Total estimated plant cost	$47,750,000	$34,500,000	$55,000,000	$45,000,000	$24,300,000	$45,000,000	Do.
Cost per KW	$370	$260	$230	$250	$325	$450	Do.
Estimated completion date	1957	1959–60	1960	1960	1959	1960	1962.

[1] This reactor is being built by the AEC; Westinghouse and Duquesne are prime contractors to the AEC.
[2] Includes 110,000 Kw of conventional superheating capacity.
[3] Reactor coolant at outlet.
[4] Not including research and development, fabrication of fuel elements for first charge of nuclear materials. Fuel element fabrication and nuclear materials are included in fuel costs.

Summary of small prototype power reactor plants proposed, pt. 2 (power demonstration reactor program projects and others)

Summary of small prototype power reactor plants proposed, pt. 2 (power demonstration reactor program)

	Chugach Electric Association	Wolverine Electric Cooperative	University of Florida	City of Orlando, Fla.	Rural Cooperative Power Association	City of Piqua, Ohio	City of Holyoke, Mass.
Location	Anchorage, Alaska	Hersey, Mich	Gainesville, Fla	Orlando, Fla	Elk River, Minn	Piqua, Ohio	Holyoke, Mass.
Type of reactor	Sodium-cooled heavy water moderation.	Aueous homogeneous.	Pressurized water	Liquid metal fuel th. br. blanket.	Boiling water	Organic moderated.	Gas-cooled closed cycle.
Thermal power	40,000 kw	31,000 kw.[1]	10,000 kw	Not available	58,000 kw	45,500 kw	44,000 kw.
Gross electrical generating capacity.	10,000 kw	10,000 kw	500 kw	25,000 to 40,000 kw	22,000 kw	12,500 kw	15,000 kw.
Amount of fuel per loading.	10,000 kg. U	12 kg	Not specified	60 kg. U–235, 17,000 lbs. th.	12 kg. enriched, 10,000 kg. normal.	6,000 kg	736 kg.
Enrichmend percent U–235.	Approx. 2 percent	Fully enriched	40 percent	Fully enriched	Fully enriched spikes—nat. U core.	3 percent	10 percent.
Moderator	Heavy water	Uranyl sulfate in heavy water.	H_2O	Graphite	H_2O	Terphenyl	Graphite.
Coolant	Liquid sodium		H_2O	U–235 in molten bismuth solution.	H_2O	Terphenyl	Nitrogen gas.
Reactor temperature [2]	950° F	570° F	450° F	Not specified	533° F	617° F	1292° F.
Reactor pressure	Atmospheric	1900 psig	1200 psig	do	900 psig	50 psig	515.7 psia.
Steam conditions	850 psig 850° F	600 psia [3] 486° F	190 psig 404° F	1250 psig 900° F	600 psig 825° F	400 psig 550° F	Not specified.
Estimated cost of reactor [4]	$5,500,000 [5]	$2,486,000	$650,000	$12,500,000	$3,760,000	$3,340,000	$2,400,000.
Estimated cost of turbogenerator plant.	$1,850,000	$1,088,000	$1,200,000 [6]	$11,100,000	$2,425,000	$1,960,000	$4,028,000.
Total estimated plant cost.	$7,350,000	$3,574,000	$1,850,000 [7]	$23,600,000	$6,185,000	$5,300,000	$6,428,000.
Cost per kw	$735	$357	$800	$512–$820	$281	$424	$429.
Estimated completion date.	1962	1960	1959	1960	1960	1960	1960.

[1] Includes superheater=7,000 kw. thermal.
[2] Reactor coolant at outlet.
[3] Steam from heat exchanger to gas-fired superheater which delivers steam at 530 psia at 825° F.
[4] Does not include research and development.
[5] Does not include design cost.
[6] Does not include building cost.
[7] Subject to change.

CONSTRUCTION OF LARGER REACTORS

Chairman CANNON. Continuing our inquiry, Mr. Murray, Mr. Davis said at Des Moines on October 10, 1955:

The construction of large prototype, or demonstration, reactor powerplants is a very necessary step for a variety of reasons. For example, many features of power reactors simply do not scale up in a wholly predictable fashion. Therefore it is necessary to go essentially to full size to get certain technical data.

I think you indicated this morning that you thought these ought to be the larger size.

Mr. THOMAS E. MURRAY. I would agree with Mr. Davis on that.

Chairman CANNON (reading):

In addition, it is impossible to estimate the cost of components, the cost of construction, or the cost of operating a power reactor with sufficient accuracy without building one. Until some of the steps are actually taken one simply cannot have a reasonable estimate of power costs in the new nuclear field.

I want to ask if you concur in that.

He further made this statement which is right in point:

It is also necessary that someone build the first generation of full-scale nuclear powerplants—a generation that will be relatively expensive—so that there will be the cheaper second, third, and following generations.

I take for granted that what is meant there is that as you build these, you will see short cuts to be made, and the cost of subsequent reactors will be less than the first.

Mr. THOMAS E. MURRAY. It should be less.

Chairman CANNON. And it is a more effective machine. [Reading:]

The first prototypes of any power reactors will be expensive. The second will be simpler by virtue of experience gained with the first. Simpler and cheaper manufacturing methods will be learned and the expanding volume will still further reduce costs.

Do you concur in those views?

Mr. THOMAS E. MURRAY. I do.

Chairman CANNON. Have you anything to add?

Mr. THOMAS E. MURRAY. No; I have not, Mr. Cannon.

Mr. Cannon, may I answer a question of Mr. Taber?

Chairman CANNON. We would be glad if you would.

Mr. THOMAS E. MURRAY. You asked something about the various types of reactors that are now contracted for and the status of those. Maybe two things might be helpful here.

Mr. TABER. I would think that those are the things we ought to have first because if we don't have them, we haven't the basis for asking the proper questions of the Commission.

Chairman CANNON. By the time it gets to you the whole schedule will be outlined.

Mr. THOMAS E. MURRAY. The only point I wanted to give to Mr. Taber, and the reason I want to give it is because I think it will help my case, is to tell you this: We have here listed the Westinghouse-Duquesne Light Co. job. We have that promised for 1957. We think that is a reasonable promise. That information is on a table I have here, Summary of Large Prototype Power Reactor Plants Proposed. That is table 2.

(Table 2 appears on p. 98.)

Mr. TABER. That is something that Westinghouse and Duquesne are doing for the Government.

Mr. THOMAS E. MURRAY. That is correct. That is what is known as the pressurized water reactor, improved.

You pick the next one and it is called the Yankee Atomic Electric Co., and there is an estimate completion date there, 1959 to 1960. That is what we list as the approximate date that the Yankee Atomic Electric Co. will complete its proposed reactor. That is 1960. That would be very fine if we had any assurance or guaranty that will happen. We have no guaranty. We have no assurance whatever.

Mr. TABER. Is that a Government contract?

Mr. THOMAS E. MURRAY. No, that project is covered by a contract for Government support under what we call our power-demonstration program. We are supporting that to a certain extent. The Yankee Atomic Electric Co. is putting up the majority of the funds that are needed.

Mr. TABER. Are they making the progress that they are supposed to? When was it started?

Mr. THOMAS E. MURRAY. They have not started. They have done some preliminary work. They have some engineering programs underway. They have the right, for instance—I don't want to be unfair to the Yankee Co.—to change their mind and decide not to go ahead with that particular reactor type, but maybe go ahead with some other type, depending on how the developments of nuclear power come out. So there is a doubt. This is the point I wanted to bring out by bringing these dates to your attention. Every one of these projects from this point on has a doubt as to when it will be started and when it will be finished, and whether we have any guaranties that it will ever be finished.

Mr. RABAUT. Would you yield for a question?

Mr. TABER. Surely.

Mr. RABAUT. How many other companies are in the same status as that, waiting to see what is going to develop? You cannot tell what is going to develop. That is a complete delay.

Mr. THOMAS E. MURRAY. It is a delay.

Mr. RABAUT. It is a tentative delay. You don't know whether it is going to be a delay or not.

Mr. THOMAS E. MURRAY. It is a reasonable delay on the part of the private industry.

Mr. RABAUT. Mr. Murray, isn't everyone watching to see what the other firm is going to develop, and thinking that maybe the other pany has the proper reactor, and that his firm is working on the wrong one?

Mr. THOMAS E. MURRAY. That may possibly be.

Mr. TABER. Couldn't we get the facts? I think we ought to get the facts. That is what I have been trying to do rather than a speech.

Chairman CANNON. Here is the tabulated statement, table II, which gives the information you are asking, but only one of them, the Westinghouse and Duquesne Light Co. project, almost wholly Government financed, $85 million, has had anything done on it.

Mr. PHILLIPS. Mr. Chairman, we haven't got that table.

Chairman CANNON. On none of the other proposed reactors listed here has anything been done.

Mr. PHILLIPS. We have not seen that table.

BASIC PROBLEMS IN DEVELOPING REACTORS

Chairman CANNON. The counsel will supply it.

Mr. Murray, as we understand it, the Commission in its approach to the problem has determined that there are four classes of problems involved. The first one is the problem of establishing the technical feasibility of doing the job, regardless of cost. This problem has been met and has been overcome so far as the five basic concepts of reactors are concerned. Would you say that is true?

Mr. THOMAS E. MURRAY. Now, I am a little confused, as Mr. Taber was, as to what you are reading from here.

Chairman CANNON. The Commission in its approach to this problem has determined that there are four classes of problems involved. The first class is the problem of establishing the technical feasibility of doing the job, regardless of cost.

Mr. THOMAS E. MURRAY. Yes.

Chairman CANNON. I take it that you agree with that.

Mr. THOMAS E. MURRAY. Yes, I do.

Chairman CANNON. Then we understand that having successfully passed the first problem, there are three other important problems which can only be solved by the construction of nuclear reactors. We have to build the reactors in order to reach a final and authoritative determination. The second one is the problem of reducing the capital costs of the full-size plants, and this can't be done until we first build a full-size plant.

Then the next problem which must be solved follows in logical sequence, and that is the question of establishing the reliability and operating costs of the plant. Again this can only be done by its operation or would you say so?

Mr. THOMAS E. MURRAY. I think so. I think the only way to establish accurate cost is to build something.

Chairman CANNON. The last problem which must be solved—and the sooner we solve it, the better—is the establishment of the cost of the supporting reactor service industries which consist of the fuel fabrication, the chemical processing, and the other required services. Do you agree to that?

Mr. THOMAS E. MURRAY. I do.

PRIVATE CONSTRUCTION OF LARGE POWERPLANTS

Chairman CANNON. The Atomic Energy Act of 1954 became law on August 30 of that year. This act declared as a matter of national policy that civilian nuclear powerplants should be built by private enterprise and authorized the Atomic Energy Commission to render valuable assistance to private industry in so doing. As we sit here today, this is practically 2 years later. I would be glad if the Commission would tell us whether private industry has commenced the construction of any large nuclear powerplant up to this time.

Mr. THOMAS E. MURRAY. The answer is, "No."

Chairman CANNON. Proceeding further along that line, the only nuclear powerplant presently under construction is the pressurized water reactor at Shippingport. This plant was authorized by Congress prior to the enactment of the 1954 Atomic Energy Act. It is financed almost exclusively by Government funds. We will go into the

funding of the Shippingport plant later on in these hearings, but the point I want to make now is that the only plant under construction is Government financed. Is that true?

Mr. THOMAS E. MURRAY. That is so.

Chairman CANNON. That being true, don't we naturally draw the conclusion that we should not overlook Government participation in the program? We must get results. We don't have too much time in which to get them. Up to this time the only results we have secured are through Government participation. Then it naturally follows that we should press that point, or do you think so?

Mr. THOMAS E. MURRAY. I think by all means we should press it.

Chairman CANNON. We now take up the power-demonstration program. Admiral Strauss has told us that we are building five experimental power reactors, each with a basic and different design, and each holding the promise of some day producing efficient and economical nuclear power.

Admiral Strauss, do we know or have we reason to believe that 1 of these 5 basic concepts may turn out to be the ideal concept for the production of commercial power?

Mr. STRAUSS. I think one or more may. Since you have given my colleague an opportunity to respond to a previous question, may I have the same?

Chairman CANNON. Yes.

COMMENTS ON EDITORIALS ON DELAY OF NUCLEAR POWER PROGRAM

Mr. STRAUSS. You asked at the beginning of the hearing what explanation might be provided for editorials of the nature of one which you read before the luncheon adjournment, and one after lunch, and I would like to comment.

I think those editorials are obviously not written as a result of any information obtained from the Commission. I can only assume that they are the result of inaccurate statements which have been made by persons who are not well informed. I will come directly to the point to illustrate that.

One of these statements is that greater progress is being made in the United Kingdom on electricity from atomic power than here. As has been testified here previously, a plant which will produce atomic power as a byproduct of a weapons material is expected to be brought on stream by the British Government in October of this year. But I can tell you also, and for this I would like to have your permission to go off the record because it does involve an international matter.

Chairman CANNON. Off the record.

(Discussion off the record.)

EXCHANGE OF INFORMATION

Chairman CANNON. Then we are exchanging information?

Mr. STRAUSS. Yes, sir, we are exchanging information.

Chairman CANNON. Do you think we are giving them more information than we are receiving?

Mr. STRAUSS. No, sir, I don't think one can measure it in numbers of items. One piece of information from them which may be of great importance to us might counterbalance a large amount of infor-

mation that we give them. At the present time the flow is larger from the United States to friendly countries than it is in this direction. We hope some day that will balance.

Chairman CANNON. Would you say, then, in view of the fact that we are exchanging information and the progress they have made, which everybody concedes is rapid, is due to the fact that they have proceeded on information that we supplied them and that indicates there is no competition?

Mr. STRAUSS. No competition?

Chairman CANNON. Yes.

Mr. STRAUSS. I think there is competition. I do not think that the editorials are justified in giving the reading public the impression that we are second. Today we are first in this contest, if it is a contest, which I question, by a very large margin.

ACCOMPLISHMENTS OF COMMISSION

Now, Mr. Chairman, also you pointed out, and quite properly, that there was very little to show for this program over 2 years, although I have brought some photographs here, that I think you will find impressive, and whenever you permit me to show them—they are large ones—they will indicate construction which is presently under way.

I will call attention to the fact that it requires probably 2 to 3 years, probably the latter period, to build an electric plant of the most conventional design, a steamplant. If ground had been broken with the passage of the Atomic Energy Act of 1954, on the day the bill was signed, to build a 100,000-kilowatt electric plant of the most orthodox and practiced design, it would still not be ready.

If you will hold those pictures up, the members of the committee may be interested.

This is the Shippingport plant. A good deal more progress has been made on it than shown here.

Chairman CANNON. Why is progress so slow?

Mr. STRAUSS. I would not call it slow when you consider that ground was broken for this only on Labor Day 1954. This plant is not 2 years old. What you see here is above the surface of the ground. That plant, like an iceberg, has a large part of its body submerged. This platform here will house the electric generating part of the plant. Every penny of the cost of that part is being borne by private contractors.

The Westinghouse Co., which is building the plant, has contributed its profit. The Duquesne Light Co., is contributing to our end of the plant, the atomic end of the plant, $5 million. They are giving the site. They are paying a substantial part of the operating cost.

Chairman CANNON. How would you say that this photograph here compares with photographs which were shown at Geneva of the Russian plant?

Mr. STRAUSS. The Russian plant could be housed in one bay of this plant. This plant is going to produce between sixty and ninety thousand kilowatts. The Russian plant is a 5,000-kilowatt plant of a totally different principle.

Chairman CANNON. Is this the largest ever undertaken?

Mr. STRAUSS. I cannot say what other plants the Russians have. This, I believe, when it comes on stream will be the largest plant of its kind in the world. Is that correct, Mr. Davis?

Mr. DAVIS. Bigger than Calder Hall.

Chairman CANNON. How does it compare with the British plant which is now under construction and is supposed to go into operation next year?

Mr. STRAUSS. The British plant is a combination of two reactors, separated by a few hundred yards. Each of them will be about 35,000 kilowatts. The aggregate of the two is somewhat less than we expect from this one. There are two other pictures here that might interest you.

This is the aqueous homogeneous reactor simply in its early stage at Oak Ridge. That is the reactor core, that globe that you see up here. I am trying to find a man here to give you an idea of the relative size. Here are men in the foreground.

Mr. TABER. Where is this?

Mr. STRAUSS. This is at Oak Ridge.

Chairman CANNON. As I understand it, Admiral, that is not a commercial plant. That is an experimental plant.

Mr. STRAUSS. I am very glad you raised that point. This is one of the stages through which a reactor design must go before it is safe to start a full-scale reactor.

Chairman CANNON. Then this is experimental.

Mr. STRAUSS. This is experimental. If it was decided tomorrow to build a 100,000- or a 200,000-kilowatt reactor on this principle, the probability is that a stage intermediate between this and that would have to be built. Certainly this experimental plant would have to be completed. This is not yet completed.

I don't want to take too much of your time but I would like to show you what this "collapsed" program is. This was taken some months ago. It is the Army package power reactor that we are building at Fort Belvoir, not far from Washington. This pressure chamber here is now complete.

Chairman CANNON. This is located in what State?

Mr. STRAUSS. Fort Belvoir, Va. This reactor is one which the Commission has designed with the idea that it can be disassembled—not this one, but others like it, as this will be used for instruction—and transported, if necessary, by a plane to remote locations for the Armed Forces.

This picture shows the outside of the plant at Santa Susana, Calif., which North American Aviation is constructing as a prototype of the plant which they will build in Nebraska. It is well along toward completion at the present time. The generating equipment here is largely outside of the plant. I thought there was a picture of the interior. There is not. The reactor itself is housed in this central building.

This picture here shows the housing for the boiling-water reactor at our laboratory at Argonne. It will be producing enough electricity to supply the whole laboratory.

Chairman CANNON. Mr. Rabaut.

Mr. RABAUT. Will they all have to have housing, something like this, eventually?

Mr. STRAUSS. No, sir. This particular type of reactor we house this way (*a*) because of its experimental nature, and (*b*) because it is situated within a few hundred feet of offices and laboratories. The chamber to retain gases and effluents in the event of a rupture is not necessary in all types of reactors. Would you describe those types, Mr. Davis, which do not require them?

Mr. DAVIS. I believe generally a reactor that would be placed near any center of population will probably have either a containing vessel of this sort or, alternatively, a building of the sort that was around the sodium graphite reactor in the picture. It is, in fact, a more or less conventional type building. A steel containing vessel is not always required.

Mr. STRAUSS. This exhibit is not complete, Mr. Chairman. Ground has been broken also by the General Electric Co. for the prototype of the plant which they will build in Chicago for the Commonwealth Edison Co. I think it is only fair to say that any construction of a full-scale plant should prudently require, as a preliminary step, the construction of these prototypes, and, therefore, to say that none of these plants is under construction is, I submit, incorrect, since the prototype plants are being built, and they are necessary before any full-scale plant can be built safely.

INCENTIVES OF PRIVATE INDUSTRY TO MOVE FORWARD

Mr. RABAUT. This morning, Commissioner Libby, you made a comparison of scientists and highly technical engineers in private plants, and indicated that, in your opinion, they had a greater devotion to the weapons program than they did to the general use of atomic energy for civilian uses. Am I correct in that?

Dr. LIBBY. That is essentially right. The reason, Mr. Rabaut, is that they will do it for patriotic motives to defend the country, sir. These motives, I maintain, are not quite as strongly operative in the peaceful-uses program.

Mr. RABAUT. That is probably true. Is it not also true that any development that comes from this will eventually accrue to these plants. After all, when this is finally completed, or the final goal is achieved for the use of this energy for peaceful purposes, the units comprising the final product will come from private industry, and there should be just as much devotion on the part of the technical knowledge in the industry to one as to the other?

Dr. LIBBY. Mr. Rabaut, at the present time, as we have said repeatedly in the course of the hearings before this committee, the scarcest item is manpower. The companies have to husband their manpower very carefully. They have many times more projects than skilled manpower to work on them.

Mr. RABAUT. That statement of yours this morning has been bothering me ever since you made it, because we are in competition—I don't want to use the word "race"—in this matter with the other countries of the world, whether they be friend or foe. We are in competition with them. Certain prestige is going to come to the country, before the whole world, which first develops this matter. It seems to me that the large industry of America that is really making the component parts of this under the guidance of your Commission should be the first to

recognize that situation is going to be particularly beneficial to them in their own line of business and should certainly prod their engineers and scientists to give the best they have for peaceful purposes. I cannot understand any other approach that should be made to it.

Dr. LIBBY. If you consider a company that has a normal business that has little to do with atomic energy, in order to go into atomic energy they have to take their men away from the work they are normally employed on and put them into this because it is so difficult to hire new men.

Mr. RABAUT. Yes; but there is just as much a deviation here as there is from the horse and buggy to the automobile.

Dr. LIBBY. I agree.

Mr. RABAUT. Anybody who knows what the change has been in this country has to know what change there will be in the present type of power and the power we are hoping to develop.

Dr. LIBBY. Yes, sir. It is certainly a great benefit to the company to have its technical staff get acquainted with atomic energy. It is a great benefit.

Mr. RABAUT. I wonder how much the Commission is stressing that with these companies?

Dr. LIBBY. We try to be very persuasive. Don't misunderstand me, Mr. Rabaut, please, about our contractors now working on our weapons program and our present program. They are doing excellent work for us. They are putting in very excellent men for the very small fees they receive.

Mr. EVINS. Will the gentleman yield?

Mr. RABAUT. Yes.

Mr. EVINS. The wagon manufacturers did not encourage their mechanics to learn automobile mechanics, did they?

Mr. RABAUT. No.

Mr. PHILLIPS. How about Studebaker?

Mr. RABAUT. Studebaker came in way late.

Chairman CANNON. Mr. Boland.

Mr. BOLAND. It would seem to me that Dr. Libby's assertion makes good sense. I would think that these companies are more concerned with the peaceful-use problem than the weapons program. None of us has any difficulty with the enthusiasm and patriotism these people have in the weapons program, but where it comes to a program whereby private industry is going to be the beneficiary they would enter it with greater enthusiasm if their own company is involved.

Mr. RABAUT. That is the point I am making.

Mr. BOLAND. That is the point Dr. Libby made.

Mr. RABAUT. No; he said they gave more to the weapons program.

Mr. BOLAND. As long as their company develops it, their engineers will enter into the program a lot more enthusiastically if they are doing it within their own realm of things than if they are doing it under Government supervision.

Mr. RABAUT. I was not debating that part of the program.

I was debating that part of the program where he said it was very difficult to get the top sphere of engineers or that they would

not assign the top sphere of engineers to it as they would in the weapons program.

Dr. LIBBY. That is my fear.

Mr. RABAUT. That has bothered me ever since he said it.

Dr. LIBBY. This is my fear and this is why I am worried about the approach of having the Government go out on a cost-plus-fixed-fee basis, and go at building these things in the same way that we go at building our bomb laboratories and at our weapons program. I am worried about getting the same quality of technical help under these conditions, the pressure being so very great for these people of rare ability to work on the company's normal business. If we can get the company in as partners, then I think we have them. That is what I would like to see us try first. If we really can't do this, and I think the signs are good that we can, we will have to do the other thing, because we have to get at this problem and get atomic power. I think we will get it faster if we can do it on a partnership basis. That is just one man's opinion.

Mr. BOLAND. If they were motivated by the same sense of urgency that some believe ought to motivate this program, you probably would have no difficulty with them.

Dr. LIBBY. If they were motived with the same sense of urgency as in the hydrogen bomb program, there would be no problem.

CONSTRUCTION OF REACTORS IN SAN FRANCISCO AND CHICAGO

Chairman CANNON. Dr. Libby, the photograph of a reactor just shown to be built near Chicago, and which is to be the largest of its size up to this time, will be built, as I understand, by Commonwealth. Simultaneously, you are proposing to build in San Francisco a reactor of the same type but much smaller—5,000 kilowatts—which like the Chicago reactor is of the boiling-water type?

Dr. LIBBY. Yes, sir.

Chairman CANNON. I took for granted that you were building it, and as a matter of fact the statement was made that you were building one of each of the different types of reactors. Why are you building 2 of the same type, 1 larger and 1 smaller, and by different firms? Here is 1 by Commonwealth, and the 1 in San Francisco is by General Electrict for Pacific Gas & Electric.

Dr. LIBBY. General Electric will build both.

Chairman CANNON. Why in San Francisco where there seems to be little need of additional power.

Dr. LIBBY. As Chairman Strauss says, it is almost necessary to have a prototype or small plant before you can move ahead on these giant plants. That is the reason, Mr. Cannon. There are so many problems. We have always done this. The Arco plant which was the test plant for the submarine *Nautilus* serves in a sense as the prototype plant for the Shippingport reactor. We have in each instance built a small-scale plant of the size of the General Electric plant in California in order to help us better design the full-scale plant. It seems to be the sensible way to go about it. I am not saying it will always be necessary to do that. There may be cases where we can skip this. But I think it is prudent at this time to do it. I think General Electric is very wise to do it.

Mr. BOLAND. Mr. Chairman, on that point, what is the difference between the one you are building at the Argonne National Laboratory, and the one at Livermore? The one you are building at Arco is experimental; is it not? Isn't that a prototype?

Dr. LIBBY. The Argonne reactor is also a prototype. But there are differences.

Chairman CANNON. The General Electric expects to cut the one at San Francisco into the local power system?

Dr. LIBBY. I am sorry, I don't know.

Mr. STRAUSS. What is the question, sir?

Chairman CANNON. This plant which they propose to build in San Francisco is to be cut into the local power system?

Mr. STRAUSS. We are told that is the plan. We are also told that is the plan with the one at Santa Susana, which is being built by North American Aviation, Inc. That is the one you described as being outside of Los Angeles.

Mr. ANDERSEN. Mr. Strauss, would you say that was also the plan relative to Elk River?

Mr. STRAUSS. The Elk River plant is not a prototype plant. These are all experimental plants. I should emphasize that. But the Elk River plant is being built for Elk River. That is to say, it is not something which is going to be scaled up for later construction somewhere else.

Mr. ANDERSEN. But the energy from that would be put into the REA lines in that vicinity?

Mr. STRAUSS. That is our understanding.

POWER DEMONSTRATION PROGRAM

Chairman CANNON. Dr. Libby, will you describe for us the first round of the power demonstration program? We have a name here, and we are not yet familiar with it. What is involved in the power demonstration program? Tell us what it is.

Dr. LIBBY. Fundamentally, to move ahead on the construction in a partnership way of full-scale plants to test out ideas which we think are ready to be tested out. We have the reactors listed on the sheet here, the Yankee pressurized-water plant, and the 2 others, the Consumers sodium graphite plant, and the fast breeder, which is a very important development by the Power Reactor Development Co.

LOCATION AND STATUS OF PLANTS

Chairman CANNON. In this first round, you propose, three large plants, at Rowe, Mass., Monroe, Mich., and Nebraska. This is the first round for these three big ones. In those the Government makes a very limited contribution, as I understand it, of the order of 4 or 5 million dollars. But the private contractor also is to return, in exchange for that money, any information which it secures in developing them.

Dr. LIBBY. Yes, sir.

Chairman CANNON. Have any of them gone far enough at this time to learn whether or not that will be practical?

Dr. LIBBY. I will have to ask Mr. Davis how much we have learned so far from the companies.

Chairman CANNON. Mr. Davis, can you tell us about that?

Mr. DAVIS. I don't believe that they have gone far enough yet in their development so that one could assess this. For example, in Consumers (Nebraska), the work is being done as far as the reactor is concerned by North American Aviation, who are presently developing the sodium graphite reactor, and we get every scrap of information that they are developing in connection with this project.

Chairman CANNON. That means we are standing still? You say they have not proceeded far enough?

Mr. DAVIS. They have not had their plants under construction. In the case of Consumers Public Power District of Nebraska it is because before they can go ahead with their construction the sodium reactor that you saw a picture of has to be operated.

Chairman CANNON. We are on dead center so far as any technical information that you expect to derive from these when they are in actual operation?

Mr. DAVIS. We are not at a point yet when we can get any operating information.

Chairman CANNON. That also means we are not getting anywhere. This second round seems to be smaller plants. They will produce only 5,000 to 40,000 kilowatts. What is the distinction between those and the first round?

Mr. DAVIS. In the second round we specifically set size limits between 5,000 and 40,000 kilowatts in an endeavor to stimulate the construction of reactors of this size.

Chairman CANNON. In this first round, you propose to give them a waiver of charges for loan of source and special nuclear material, for fuel for a period of up to 7 years. That means that they will be supplied with fuel for that time without cost to the private enterprise.

Mr. DAVIS. No. What that means is that we will not make the charge we would otherwise make of 4 percent per year for the fuel which they have in their inventory for a period of 5 years after the start of operation.

Chairman CANNON. It says 7 years here.

Mr. DAVIS. In the first round we offered this waiver for a period of 7 years, which would be to July 1, 1962. In the second round, we made it for 5 years of operation. There are some differences between the offers that were made in the two rounds. I might point out that in the second round, which was directed toward the smaller reactors, we gave more encouragement since we felt that the proposers would be mostly cooperatives. For example, we would help pay for and retain title to the reactor. The whole second round was then directed toward trying to provide an opportunity for the small cooperatives and small utilities and the small manufacturing companies to get into this business.

Chairman CANNON. And you also give them the use of the AEC laboratories for certain research and development work without cost over what period?

Mr. DAVIS. We did not specify the period.

Chairman CANNON. What did you have in mind?

Mr. DAVIS. We contemplated here that we would provide such assistance over the time that the reactor was being developed and constructed and over part of the time it might be actually in operation. This was necessary.

Chairman CANNON. You also give them the support of research and development work in non-Commission facilities in return for research and development information.

Mr. DAVIS. That is correct.

Chairman CANNON. In order to assure that assistance would not interfere appreciably with the industry incentive, the exact amount of the Commission's contribution is to be determined prior to acceptance of any proposal and any greater costs so incurred are to be borne by the company or the group making the proposal.

DEVELOPING CIVILIAN ATOMIC POWER

We will insert at this point a tabulation of developing civilian atomic power prepared by the Division of Reactor Development, May 1, 1956.

Mr. PHILLIPS. That is May 10.

Chairman CANNON. Yes.

(The chart referred to may be found on p. 97.)

Mr. PHILLIPS. Mr. Chairman, could inquiry be made of the witnesses as to whether now, since this is dated May 1956, and presumably this was made a month before that, what we are now apparently getting into is three separate tabulations of a status in which we now find ourselves practically at the end of June. Don't you think, Mr. Chairman, it would be more to the point if we have a tabulation as of this moment put in the record, if one is to be put in, in whatever way the Chairman wishes that to be put in?

Chairman CANNON. Mr. Davis, are you in a position to put that in?

Mr. PHILLIPS. Could it be changed from any of these?

Mr. DAVIS. If you are speaking of this chart No. 11, I believe this is still the current chart.

Chairman CANNON. The counsel reminds me that we have it in chart XI.

Mr. PHILLIPS. Is that the one in the book at page 341?

Mr. TABER. No.

Mr. PHILLIPS. What have we here? Here is what purports to be an up-to-date statement, called table 2, part 1, but does not have as many items or projects as the one marked "chart XI," identified as May 10, 1956. My point is only to avoid putting in the record. Mr. Chairman, three separate charts none of which completely compares with the other, but to make sure that we have all the information and to have it up to date.

Chairman CANNON. It will be a little difficult to arrange that without the 3 charts. By putting in the 3 charts, you have every phase of it.

Mr. PHILLIPS. I think, Mr. Chairman, that Mr. Davis was about to say that the chart marked "XI" supersedes the chart on page 341. Am I right?

Mr. DAVIS. Yes, this is the most up-to-date chart. Table 2 is the summary of the technical detail.

Chairman CANNON. It does not show the first round and the second round which is the very matter we have been discussing.

Mr. DAVIS. I cannot identify which of those are.

Mr. PHILLIPS. The idea is that all three will be in.

Chairman CANNON. All three will be in the record and will give you all the information which you wish.

CLOSED-END PRINCIPLE

Under the closed-end principle, AEC may extend various forms of assistance, but once agreed to, the dollar amount of assistance to be provided by the Commission is fixed. The proposers have the full technical and economic responsibility. If the project costs more than planned, the extra amount comes out of their pocket. If it can be done for less, then they are ahead that much. It is that much more in their pocket. This is under the power demonstration program.

That is a very practical arrangement, and you think there is sufficient incentive there to make it effective?

Mr. DAVIS. Yes, sir.

Chairman CANNON. It is a matter of reciprocity. They receive this advantage and in return for it, they give the benefit of their experience learned in the operation of these reactors.

Mr. DAVIS. That is correct.

INDEPENDENT INDUSTRIAL PROGRAMS

Chairman CANNON. Passing over to the next subdivision, "Independent industrial programs", my understanding is that we get nothing back from that at all, is that true?

Mr. DAVIS. They are not obliged to give us any information beyond what is required for them to obtain a license, which does require that they give us a considerable amount of technical information for that purpose. They also have to provide certain information with respect to the use of fissionable materials. We have no basis for requiring that they furnish us with detailed technical information on the construction and operation of the plant.

ATOMIC GIVEAWAY

Chairman CANNON. They are under no obligation?

Mr. DAVIS. They are under no obligation to do that. Some of them have indicated, however, that they will provide us with the information.

Mr. ANDERSEN. Mr. Chairman, on that point might I ask if one of these companies under this heading happened to develop something worthwhile, can they sew it up with a patent, and not make it available in any way to our Government?

Mr. DAVIS. They can certainly get a patent on it. There are some provisions of the act, and in addition to that, I should point out that patents are not generally held very closely in the utility business.

Chairman CANNON. They can patent any information they secure, and they are under no obligation to provide it gratis to the Government.

Mr. DAVIS. That is right.

Mr. ANDERSEN. In an emergency they would be forced to turn such information over to the Government, would they not?

Mr. DAVIS. I would expect they would be, but I am not an expert on that subject.

Mr. ANDERSEN. One further question, Mr. Davis. Do we contribute to those experimental plants in the final column?

Chairman CANNON. Admiral Strauss has given us that.

Mr. ANDERSEN. I was wondering about that point, Mr. Chairman; do we contribute anything?

Mr. STRAUSS. No, sir; nothing.

Mr. ANDERSEN. That answers the question.

RIGHTS OF PRIVATE INDUSTRY TO DISCOVERIES

Chairman CANNON. Admiral Strauss has made the statement, as I understand it, that any private power groups are entitled to retain all rights to any new discoveries or inventions resulting from the development and construction of the plant. They have no obligation to surrender them to the Government for public dissemination. Since the Commission tells us that we must go through at least 1 generation of 7 to 10 years at a minimum of nuclear plants in order to answer crucial questions, then how can you say, Admiral Strauss, that that principle can be justified for any group, private or public, that has been given technology to the 5 basic concepts?

Mr. STRAUSS. The mistaken impression prevails that some rights have been given to these companies, or that they have staked out a position with respect to a specific type of reactor, with the inference that no one else could come in and build that reactor. That is not so. If that impression prevails, we should do our best to dispel it. There is no right given to any of these people with respect to a given type of reactor. Anyone else can come in on the basis of this independent industrial program and build any one of these types he wishes. All he has to do is to obtain a license from the Commission for which he has to conform to certain statutory requirements.

Mr. PHILLIPS. May I ask a question, Mr. Chairman?

Chairman CANNON. Mr. Phillips.

Mr. PHILLIPS. Mr. Strauss, is there any marked difference between that method of licensing and the method by which we license any of our isotopes or reactors or anything else for use in medicine, agriculture or otherwise? That is, the man desiring to use it, makes a revelation of his intent and background, and you lease him something to use?

Mr. STRAUSS. That is right. You might be interested for example to know this, that the boiling water reactor is being worked on by General Electric and American Machine & Foundry. That the pressurized water reactor is being worked on by Westinghouse, Alco, Glenn Martin, Babcock & Wilcox. The aqueous homogeneous reactor by Foster Wheeler and Westinghouse. Graphite by North American Aviation. The liquid metal reactor by Babcock & Wilcox and Dow. So there is not any priority, or what shall I say, exclusivity granted to any company.

Mr. PHILLIPS. "Monopoly" is the word you are seeking for.

Mr. STRAUSS. Monopoly is the word I will accept.

Mr. PHILLIPS. I think the Chairman is correct in raising a question that if there is a misapprehension on this, it ought to be cleared up. If I may, I would ask the Chairman of the Commission another question:

Isn't it a fact that these various groups who might come to you and lease the right to make reactors and whatever they have to have from the Commission, have they not themselves established a research group and have they not publicized the fact that all the findings of this research would be made available to everybody in the industry?

Mr. STRAUSS. I don't know the extent to which they have published that. It is the generally accepted practice.

Mr. PHILLIPS. If the Chairman will permit me, I have here a statement—we have in this committee turned to reading editorials and statements—which says that they are forming a technical appraisal task force to evaluate and stimulate research and so on, and that it is made up of the Nation's leading nuclear engineers and scientists as well as leaders in the industry, and then this statement:

> The findings of this task force as well as all other experience and knowledge of America's power companies in the field of nuclear reactors will be shared with any group dedicated to the objective of maintaining American leadership in atomic electric power.

I would certainly include the Atomic Energy Commission as a group dedicated to the objective of maintaining American leadership. That is a publicized statement which I am reading at the present time.

Mr. STRAUSS. It certainly bears out your previous statement.

Mr. PHILLIPS. I was reading, Mr. Chairman, from the advertisement that we are going to subpena somebody to bring down here and explain.

Mr. JENSEN. I think, Mr. Chairman, if I may supplement that statement by saying that it appears quite plainly that there are some people in the country, maybe in this Congress, that think in this atomic power development we should be able to jump from the old model T Ford basis to the latest model basis just overnight, and in a few days or a few months or even a few years. That is an impossibility. It is just too much to expect.

Chairman CANNON. Getting down to the gist of the matter, is there any significance, Doctor, in the fact that the only applicants you have under this section of the law are the private power groups?

Mr. PHILLIPS. From which Doctor do you want the diagnosis?

Mr. STRAUSS. If you will turn to chart XI, Mr. Chairman, in the third column you will see toward the bottom of the column, the city of Orlando, Fla.

Chairman CANNON. I am discussing the last division, the independent industrial program. That is the giveaway program, because there they are not required to return any services.

Mr. STRAUSS. The Government is not putting up anything, sir.

PARTICIPATION OF PUBLIC POWER GROUPS AND COOPERATIVES

Chairman CANNON. They are required in the first round to return to the Government the benefit of any developments they may acquire. It seems to me that it is significant that the only applicants under the

independent industrial program are private power groups. What does the Commission desire to say as to why the public power groups and cooperatives have not applied?

Mr. STRAUSS. I could not give you an answer to that except to say at the present time that the public power groups are in hopes of obtaining some assistance from the Government.

Chairman CANNON. It seems to me or would to anybody, obvious that the reason they don't is because they haven't the money. The private power groups have the capital, the money. They have made application, and they are getting the advantages and they don't have to return anything at all. Whereas, the public power groups and cooperatives, being without that capital, are unable to take advantage of it.

Mr. STRAUSS. All they are required to return to the Government is information. They are not required to give the Government any money. No capital is required from them for any obligation that they undertake to the Government, Mr. Chairman. I was just about to cite the number of them. I think considering how young this program is, less than 2 years old, there is the city of Orlando, the city of Piqua, city of Holyoke, the Nebraska Public Power—it doesn't go by that name—Consumers Public Power District of Nebraska, the Chugach Electric Association of Anchorage, Alaska, the Wolverine and the Elk River.

Chairman CANNON. Just what progress has been made with these concerns you have named?

Mr. DAVIS. In the Consumers Public Power District, we are planning to build the sodium graphite reactor. We are in the process of negotiating a contract with them to provide the assistance which they have requested. North American Aviation is in the process of building the experimental reactor which will serve as a basis for this project.

The Commission has approved going ahead with the negotiation of contracts with the Rural Cooperative Power Association of Minnesota at Elk River. This project is a boiling water reactor which follows up the technology of the borax experiments, and of the experimental boiling water reactor under construction at Argonne.

The Wolverine group is going ahead, and we are presently negotiating a contract with them, and they are basing their work on an aqueous homogeneous reactor of the type that is under construction as an experimental plant at Oak Ridge.

COST OF POWER DEMONSTRATION PROGRAM PROPOSALS

Chairman CANNON. How much money is each of these entrepreneurs to receive in exchange for the information which they give to the Government?

Mr. DAVIS. We have this listed on a chart here, table IV.

TABLE IV.—*Costs of power demonstration program proposals*

[In thousands of dollars]

Project	Total project cost [1]	Cost to AEC	Cost to industry	Construction costs		Research and development	
				AEC	Industry	AEC	Industry
FIRST ROUND							
Yankee:							
Nuclear	$39,500	$5,000	$34,500		$18,500	$5,000	
Nonnuclear					16,000		
PRDC:							
Nuclear	58,450	4,450	54,000		36,000	4,450	$9,000
Nonnuclear					9,000		
Consumers:							
Nuclear	26,500	10,480	16,020	[2] $8,280	5,220	2,200	
Nonnuclear					10,800		
Total, first round	124,450	19,930	104,520	8,280	95,520	11,650	9,000
SECOND ROUND							
Elk River:							
Nuclear	9,285	6,860	2,425	3,760		3,100	
Nonnuclear					[3] 2,425		
University of Florida	2,150	850	1,300	650	1,200	[4] 200	100
Piqua	7,300	5,340	1,960	3,340	1,960	2,000	
Wolverine	4,876	3,788	1,088	2,486	1,088	1,302	
Chugach	16,850	14,975	1,875	5,500	1,850	9,475	25
Orlando	30,150	19,050	11,100	12,500	11,100	6,500	
Holyoke	10,128	6,100	4,028	[5] 2,400	4,028	3,700	
Total, second round	80,739	56,963	23,776	30,686	23,651	26,277	125
Grand total	205,189	76,893	128,296	38,966	119,171	37,927	9,125

[1] Project costs exclude cost of special nuclear materials, fabrication of cores, and fuel use charges.
[2] Includes some preoperational research and development.
[3] Includes property now owned and allocated to this project.
[4] Proposal contemplates that AEC will also pay for 5 years of operation.
[5] Holyoke proposes to pay for nonnuclear portion not to exceed cost of conventional plant.

Mr. DAVIS. In each case the amount is shown. The table shows separately the first and second rounds. It shows in the first column the total project cost, including the development and construction; the second column, the cost to the Atomic Energy Commission; the third column, the cost to the industry. On the right hand side it is broken down between construction and research and development. It shows under the first round the total cost of the 3 projects is $124 million. The AEC is putting in $20 million. The industrial companies are providing $105 million out of the total.

In the case of the second round, based on the proposals of which we have only accepted two for negotiations up to now——

Chairman CANNON. What are those two?

Mr. DAVIS. The Wolverine and Elk River, the first and fourth items in the column. In all these cases it is proposed that the Commission would pay $57 million out of a total cost of $81 million, if they all went through. In the case of the 2 that have already been approved, Wolverine and Elk River, the total cost is $14 million with the Commission being asked to supply $10.5 million of the total for these 2 cooperative groups.

Mr. ANDERSEN. Might I ask relative to Elk River, for example, the balance will be obtained via loan through the REA?

Mr. DAVIS. That is correct.

(Discussion off the record.)

Chairman CANNON. Mr. Jensen.

Mr. JENSEN. I think there is one thing that should be understood regarding these reactors. After all, they are not a complete power facility in the respect that you can build a reactor, as I understand it, and attach the power to a turbine of any particular make, such as the turbines in the big steam plants. Your atomic power reactor simply takes the place of the steam generator or boiler. In other words, it is only a part of the power-producing facility of any power-producing plant. Would someone like to comment on that? Is my assumption correct?

Mr. DAVIS. Certainly. The reactor is another means of generating steam that can be introduced into a turbogenerator to produce power. A great deal can be learned from the reactor without going ahead and generating power with it.

I might point out in connection with the homogeneous power-reactor experiment at Oak Ridge, although there is a small turbogenerator, the main thing is the conduct of the experiment, which is the generation of the steam from the reactor in the first place. It is not an important part of this experiment to generate power from the steam once you find out you can generate steam.

Mr. JENSEN. In your prototype power reactor, it would then be possible, as I understand it, for you to attach your atomic-energy reactor to the steam line or to the machinery in a steam powerplant that is already built which would generate an equal amount of power?

Mr. DAVIS. This is not generally true. The reason for this is, particularly with the water-cooled reactor, that in the steam conditions you don't have steam at as high a pressure or high a temperature as in a conventional plant. So the normal high pressure equipment could not be operated by the steam from at least some of these prototype plants.

(Discussion off the record.)

Mr. JENSEN. The point I am trying to clear up is that actually when we build a nuclear power reactor to generate steam that we are not building a complete power unit, so to speak. The related facilities that are necessary to complete a power unit do not have to be built to ascertain the adaptability or the ability of any type of atomic energy power reactor. Just how much of a facility is necessary? Take a steam facility that is already in operation and generating power with steam, just how much of that whole complete facility is necessary to build under your reactor program in order to ascertain the answers to your experiments.

Mr. DAVIS. I think in most cases for the small experimental plants it is not certainly necessary to connect up to the piece of generating equipment in order to learn most of what you are going to learn through the reactor experiment.

Mr. JENSEN. You say it is not necessary?

Mr. DAVIS. It is not. I think in one case there is an exception and this is the case of the boiling water reactor where you are planning to have the steam go directly from the reactor to the turbine. In this case you have a very close coupling between the two, and it is very difficult to carry out an adequate experiment without doing it. This is only for this one type of reactor. That means that you can do a great deal with experimental plants, and you can do it without gener-

ating large amounts of power. If you go to very large-size prototype units, then you certainly should connect these up because you are going to get some income from producing the power. In the smaller sizes then this is not an appreciable factor. If you build a 100,000-kilowatt plant you certainly are going to want to recover the power from that steam.

Chairman CANNON. The committee stands adjourned until tomorrow morning at 10 o'clock.

WEDNESDAY, JUNE 27, 1956.

THREE PROGRAMS FOR DEVELOPING CIVILIAN ATOMIC POWER

Chairman CANNON. The committee will be in order.

Admiral Strauss, we have the three programs, the Government's experimental program, the power demonstration program and then the independent industrial program.

Under the power demonstration program, as we understand it, both private power and public power are given an opportunity to build, own, and operate the nuclear powerplants. The AEC offers several types of assistance including in some instances Government funds to pay for research and development. The Government's contributions are payments for technical and cost data resulting from both the construction and operation of these privately owned plants. Such data once purchased with Government funds become available to everybody. That is characteristic of the power demonstration program, I believe. Any information developed there belongs to the Government in response to Government assistance.

Mr. STRAUSS. That is my understanding. That is correct, sir.

Chairman CANNON. Under the third plan there is considerable inducement to industry to assume all risks themselves without seeking Government financial help. A company or group which bears all the costs is entitled to retain all the rights and discoveries accruing from the technology which it learns and any invention resulting from the construction and operation of the plant. It doesn't owe the Government anything.

Mr. STRAUSS. That is right.

Chairman CANNON. Such information as is developed is their own property and unless in contravention of the statute, which expires in 1959, can be patented.

Mr. STRAUSS. I believe that is also correct.

Chairman CANNON. Now, for the benefit of the general public, which plan do you consider the more advisable? Do you think that the private entrepreneur ought to be allowed to develop this and retain all information and experience, or that the Government had better cooperate and make the information available to everybody?

Mr. STRAUSS. Mr. Chairman, there is no such distinction as the distinction between private entrepreneurs and public bodies. Any cooperative or public power organization has the same and identical privileges as the private institutions, or to put it the other way, private industry has the same rights as the public agencies, to come in and request and obtain a license under the law.

POSSIBILITY OF PATENT MONOPOLY

Chairman CANNON. Wouldn't there be a permanent deterrent if in the development of this information something basic should be discovered which would forever preclude any other company, and especially any public body, from ever using this basic information, and thereby create a monopoly under the control of any one company which happened to develop the information and had exclusive control of it?

Mr. STRAUSS. How under the patent system can you prevent the discoverer of a patentable idea from the exercise of his legal rights under the patent laws if he chooses to ask for them? I don't see how we can possibly prevent that.

Chairman CANNON. We have no desire to prevent it. But why not collaborate so that the information would be available to everybody, and afford free exercise of private initiative and private enterprise and competitive service?

Mr. STRAUSS. I think to the extent that it can be guarded against, the Atomic Energy Act of 1954 in section 153 has this to say, Mr. Chairman, which covers the point. May I read it?

Chairman CANNON. If you will.

Mr. STRAUSS (reading):

> The Commission may, after giving the patent owner an opportunity for a hearing, declare any patent to be affected with the public interest, if, (1) the invention or discovery covered by the patent is of primary importance in the production or utilization of special nuclear material, or atomic energy, and (2) the licensing of such invention or discovery under this section is of primary importance to effectuate the policies and purposes of this Act.

Whenever any patent has been declared affected with the public interest pursuant to the subsection which I have just read—

> the Commission is hereby licensed to use the invention or discovery covered by such patent in performing any of its powers under this Act, and (2) any person may apply to the Commission for a nonexclusive patent license to use the invention or discovery covered by such patent, and the Commission shall grant—

not "may"—

> such patent license to the extent that it finds that the use of the invention or discovery is of primary importance to the conduct of an activity by such person authorized under this Act.

Chairman CANNON. Is that permanent law or is it term law which expires at some definite date?

Mr. STRAUSS. Let me ask counsel whether this act has a terminal date with respect to that provision or any provision.

Mr. MITCHELL. No, sir; this is permanent legislation.

Chairman CANNON. I might ask you in this connection, Admiral Strauss, which do you think best serves the public interest—a competitive industry or an industry controlled by a monopoly?

Mr. STRAUSS. A competitive industry.

Chairman CANNON. Committee Counsel reminds me that there is an expiration date.

Mr. MITCHELL. I was just about to correct my reply. This is a provision for patents as to which application has been filed before September 1959.

Chairman CANNON. There is a definite date of termination and unless renewed, it expires in 1959.

Mr. MITCHELL. That is to say, sir, as to application in existence on that date. But as to applications which have been filed before September 1, 1959, the power continues for the full life of the patent.

Chairman CANNON. But after expiration it might be possible for one firm to establish a monopoly, and as Admiral Strauss says, a monopoly would not serve the best interests of the people of the country.

Mr. STRAUSS. I thought you said a monopoly of power.

Chairman CANNON. I meant control of production and distribution. Do you advocate a monopoly of control and distribution of power?

Mr. STRAUSS. No, sir, I do not.

Chairman CANNON. You think it would not be best for the public welfare that it should be in the hands of one giant monopoly?

Mr. STRAUSS. No. I think that competition regulated by the State bodies which are in existence and the various State power commissions, and the Federal Power Commission have been demonstrated, Mr. Chairman, as a satisfactory and time-tested means of protecting the public interest.

I would call your attention to this. The new ideas, the patents that are likely to originate in this field will be originated not by these contractors who have come in to build these plants, but by the individual American companies of which there are many thousands that will be making components and parts for these plants. These are the companies which have been the backbone.

Chairman CANNON. You mean the construction of the plant or the manufacture and distribution of power?

Mr. STRAUSS. In the construction, building, and design of the plants.

Mr. PHILLIPS. And the equipment.

Mr. STRAUSS. And the equipment. These are the sorts of companies which have been engaged in and are responsible for the phenomenal development of American industry. I think it is generally recognized or widely recognized that the patent system of the United States has provided the incentive on which our economy has thrived and this provision of the law, which was very carefully debated both in the Commission and by the Joint Committee before it was recommended to the Congress and adopted, was an endeavor to preserve that incentive for the American industrial system with a view to the fact that when competition in the atomic energy field became international that we should not have blunted our most important incentive.

Chairman CANNON. You say you do not advocate monopoly in the production and distribution of power. Does that include monopoly controlled solely by public regulatory bodies and commissions? Do you consider that sufficient protection of the public?

Mr. STRAUSS. No. What I meant by that, Mr. Chairman, and what I thought was implied by your question is that I would not be personally in favor of the Government monopolizing the production of power to the exclusion of public bodies or public bodies monopolizing power to the exclusion of private industry. I think the combination we have today is a useful one and a livable one.

Chairman CANNON. Very well. Then we should not in any way leave a loophole here through which either Government monopoly or private monopoly can be established.

Mr. STRAUSS. I think the law has been drawn with that in mind, sir.

Chairman CANNON. If such a monopoly should be established, do you think that public regulatory bodies can protect the public interest?

Mr. STRAUSS. I think so by reason of the fact that the Commission is enjoined by the section I read, 153, with the responsibility of declaring a patent to be in the public interest if such a condition threatens; as long as you have a Commission which is alert to its responsibilities, I don't believe that you have anything to fear from the abuse of patent rights.

Furthermore, the Commission is under the necessity of reporting fully and currently to the Joint Committee which represents the whole Congress on the subject, and that reporting, I would assure you, Mr. Chairman, is zealously respected. There is scarcely a day in which one or more reports are not made to the Joint Committee by the Commission. The average over the last several years has exceeded two reports a day.

PLIGHT OF CONSUMERS AT HANDS OF PUBLIC SERVICE COMMISSIONS

Chairman CANNON. Leaving aside the Atomic Energy Commission, and going into the broad field of regulation generally, experience has demonstrated that you cannot depend upon public regulatory commissions to protect the public interest. Let me give you one classic example.

In my own State of Missouri, we had no public service commission, and it was represented to the State legislature that we should not let competition run riot, but should establish a public service commission which would insure fair rates to consumers. The claim was made with particular reference to transportation at that time, and it was represented to the public that railroads practically exercised a monopoly, and therefore that we should have a public service commission which would hold railroad rates for transportation down to a fair and reasonable schedule.

On that representation the State legislature established by statute the Missouri Public Service Commission. No sooner had the commission been established than they called in the bus companies which at that time were just beginning to operate. This Public Service Commission was established to insure the public fair and reasonable competitive rates. The commission called in the operators of the bus companies and demanded that they increase their rates. That was directly contrary to what anybody had expected. The traveling public had been given the idea that the establishment would result in lower rates. The public bus companies appeared before the public service commission and explained that their rates are entirely satisfactory, and the return on their investment was ample. They said there was no reason why they should raise their rates, and they did not want to raise their rates. They were willing to furnish service to the public at the old schedule.

The public service commission said, "No, you raise your rates. You are in unfair competition with the railroads."

From that day to this the decisions of the public service commission have rarely been in the interest of the public. They have been predominantly in the interest of the utilities which furnish the various classes of service.

Then a remarkable thing happened. The minute that the term of a commissioner on the public service commission expired, he imme-

diately got an excellent job with the utilities which he had been regulating.

I remember very well the man who was the first chairman of the Missouri Public Service Commission, and who had been instrumental in raising the cost of transportation to everybody in the State of Missouri by raising bus rates, as soon as his term expired on the commission, he immediately received a job at a large increase in salary, and has been ever since serving the utilities.

That has happened too frequently. So it is very evident from that you can't depend on public regulatory commissions to give the public fair rates on utility service. The only remedy is to avoid monopoly.

Mr. STRAUSS. I can only say in comment on that, Mr. Chairman, that I do not know anything about the particulars. I don't know how the public service commission of the State is appointed, whether they are subject to confirmation by some elective body. Your Atomic Energy Commission, it is true, is appointed by the Chief Executive, but the members of it must be confirmed by the Senate. I do not believe that any of the past members of the Commission who are no longer serving on the Commission are in the employ of any utility. I cannot state that as a matter of knowledge.

Chairman CANNON. You are speaking of the AEC now, are you not?

Mr. STRAUSS. Yes, sir.

Chairman CANNON. As I have said, we leave all personalities out of it. We are discussing merely the broad field of the regulation of public rates, and the best way to protect the consumer from exploitation.

I will say this, Admiral Strauss, that it is a beautiful theory, a public service commission which would protect the public against exploitation. But when it comes to practical experience, you will usually find these public service commissions remarkably amenable to utility influence. The only deterrent to exploitation of the consumer is through competition. In the maintenance of competitive rates you have the only method of assuring fair rates.

Mr. STRAUSS. I certainly believe in competition.

Chairman CANNON. Again, Admiral Strauss, do you have some comment to make?

Mr. STRAUSS. I said I certainly concur; I believe in competition.

GIVEAWAY OF ATOMIC TECHNOLOGY

Chairman CANNON. As of today, Admiral Strauss, there are four large combinations of companies that have availed themselves of the largesse from the Government and are accepting from the Government invaluable technological contributions for which they are not compensating by turning over to the Government all of their discoveries and the result of all of their experience. These companies are to receive the benefit of all the technology developed by this country over a period of some 13 years at a cost of $15 billion. They are not required to give our Government and the taxpayers of this country the benefit of their solution of the complex and manifold problems inherent to the construction of commercial plants.

It is possible, then, for these four large combinations representing in the aggregate many smaller companies——

Mr. STRAUSS. Which combinations have you in mind, sir?

Chairman CANNON. For example, there is the Consolidated Edison.

Mr. STRAUSS. They are not accepting anything from the Government.

Chairman CANNON. That is the very point.

Mr. STRAUSS. No largesse from the Government at all.

Chairman CANNON. That is precisely what we are considering. They are not accepting any cooperation from the Government. Therefore, they are under no obligation to contribute to the general welfare the benefits of their developments.

Mr. STRAUSS. I am sorry, I misunderstood you. I understood you to say that these were companies that accepted some largesse from the Government. They have not.

Then there is one other matter that I am sure you would wish me to correct.

Chairman CANNON. Largesse in the form of technology.

Mr. STRAUSS. That is available to the general public, sir. There is nothing exclusive at all about that which they are receiving.

Chairman CANNON. There is Consolidated Edison of New York which has the pressurized-water-reactor type, Commonwealth Edison at Chicago, the boiling-water reactor, Pennsylvania Power & Light in eastern Pennsylvania, the aqueous homogeneous reactor, and Pacific Gas & Electric in San Francisco, the boiling-water reactor.

DISCRIMINATION AGAINST PUBLIC POWER

No public body or cooperative would have the capital with which to enter this third class—the independent industrial program.

Mr. STRAUSS. I don't know.

Chairman CANNON. You say there are four private groups here which have the capital but you know there are no cooperative enterprises which have sufficient resources to make application.

Mr. STRAUSS. That is correct. But you said that they would have no capital. I could not answer that.

Chairman CANNON. You know as a practical matter, Admiral Strauss, that the average cooperative serves its customers at cost and does not build up reserves of capital, and could not command the large amount of capital required to enter this field.

Mr. STRAUSS. That is right. If you will observe from the tables that have been furnished to you, that in the cases of those cooperatives with which we are negotiating, the Atomic Energy Commission is bearing a substantial part of the total cost.

The $15 billion figure which you mentioned, Mr. Chairman—and I am sure you would like to have me make this observation—does not represent development costs for process and knowledge that is being made available to these plants. The largest part of that $15 billion is represented by the development and manufacturing and stockpiling of weapons.

(Discussion off the record.)

Chairman CANNON. Of course, this is coordinate with and incidental to the weapon program. It is a byproduct; is it not?

Mr. STRAUSS. Yes, sir.

Chairman CANNON. That being true, the Government has invested $15 billion.

Mr. STRAUSS. Yes.

Chairman CANNON. And these companies are in a position to secure all the benefits accruing from the investment of that $15 billion with no obligation to repay in any way or compensate in any way or to in any way make available to the public such technology as they may develop.

Mr. STRAUSS. They are only entitled to a very limited part of that information and technology, Mr. Chairman. They are not entitled to any of the technology that has been developed in the weapons field. I am sure you understand that.

PATENT PROVISIONS OF 1954 ATOMIC ENERGY ACT

Chairman CANNON. The gentleman from Minnesota, Mr. Andersen, is a pioneer in this field. I would be glad if he would take up this point.

Mr. ANDERSEN. Mr. Chairman, my fears, you might say, have been largely allayed by Chairman Strauss when he made the statement which he did just a few minutes ago, to the effect that these patents under certain conditions are available to the Government.

Mr. STRAUSS. That is right.

Chairman CANNON. Until 1959 only.

Mr. ANDERSEN. That is correct. I agree with you, Mr. Chairman, that it is highly essential for the Congress to make sure that in 1959 that particular portion of the law be reenacted.

Chairman CANNON. And in the event it is not reenacted, then the best interests of the public are conserved by following the first two programs, the experimental program and the power demonstration program, rather than the industrial program under which the Government secures nothing.

Mr. ANDERSEN. Mr. Chairman, at the same time I would like to make my position clear. I certainly want to give to private industry, as such, every opportunity to develop in cooperation with the Atomic Energy Commission anything which might be beneficial to our Nation in the future.

Chairman CANNON. In other words, as the admiral very well said, "No public monopoly and no private monopoly."

Mr. ANDERSEN. Absolutely. I am glad you brought up that statement not once, but several times here, to which the admiral very vigorously asserted that he is not in favor of a monopoly at any time in connection with developments of this nature. I certainly want to compliment you on that, Admiral.

Mr. STRAUSS. That is the view of the whole Commission.

Mr. ANDERSEN. I will yield to Mr. Taber.

Chairman CANNON. Mr. Taber.

Mr. TABER. Admiral, just so that the committee may have a picture of this situation, I would like to have you take those items that appear in the second column of chart XI and go down the line and tell us as to these different projects what the AEC is planning to put up, and what the private parties are planning to put up, so that the committee may see that.

Mr. ANDERSEN. Mr. Taber, if you will excuse me, let me first finish my question, and then he may answer your question.

There is just one point, Mr. Strauss, that I would like to be clear on. Let us go into the subject of patents. Just how important must a certain patent or development be before the Federal Government will

step in and say that it is in the public interest to take it over and make it available to anybody doing research along these particular lines. I am thinking that we might have something which might be quite important in the line of a development, and which should be made available to industry or to cooperatives or whoever might be interested as a whole, and yet perhaps that particular development might not be important enough to justify the terms that you used, and thus automatically becoming available nationwide. Am I hitting upon a loophole which perhaps might be seized upon by these companies we are referring to, to the extent, perhaps, that portions of this law might be set aside to all intents and purposes? Do you see the point I am driving at?

Mr. STRAUSS. I think I do.

Mr. ANDERSEN. I want to find out how important an invention must be before the Federal Government will step in and say that it is to the best interests of the Nation that this particular development or invention may be made available for the best interests of the people of the United States. Will you elaborate on that, please?

In other words, what I am seeking just in a few minutes discourse by you or any member of the Commission is further assurance that the law, as you read it, will take care of the problem advanced by Mr. Cannon and myself.

Mr. STRAUSS. Mr. Andersen, let me attempt to answer your question, and if the answer is not concurred in by the members of the Commission who are present, perhaps they will speak up.

No such situation has yet arisen, and therefore we have no precedent to which I can refer. But let us say for the sake of argument that some time in the course of the next several years a patent is applied for, and received, which affects the public interest in the opinion of those who would like to make use of that patent. I assume that under those circumstances the Commission would have to have hearings, something we have not done, in order that both sides of the argument could present their case. Upon the conclusion of those hearings, and upon the basis of the evidence received, the Commission would then exercise the responsibility placed upon it by section 153 of the act, and determine whether or not the patent in question was affected with the public interest.

In the event that the determination was affirmative, to the effect that it was so affected, the Commission is obliged by the law, which says that it shall make it available.

Mr. Mitchell says he would like to elaborate on that.

Mr. MITCHELL. There are two avenues provided under section 153 by which this determination may be made. The Commission may move on its own motion. This is the provision to which the Chairman has referred. There is another provision which authorizes any licensee or anyone who is engaging in research and development activities under section 31 or any applicant for a license to come before the Commission on his own motion and make a showing to the effect that a particular patent is important to his activities. If he makes such an application, then as the Chairman has indicated, the Commission is required to hold a hearing. If the Commission finds that the licensing of this patent is of primary importance and necessary for the activities of this particular person, then the Commission may require the owner of the patent to license the particular individual. So there are these two methods by which this may be accomplished.

Mr. ANDERSEN. What I had in mind, Chairman Strauss, was something of this nature. We look forward perhaps to some development along the line of research in atomic energy which might have to do with the basic health of the Nation. We might find a cancer cure, for example, because of the work in which you gentlemen are primarily interested. If it should be developed by research by one of these great institutions, research which is only made possible because the Government has turned over to these particular companies the right to use its technological discoveries, I would not want any individual or group to keep a stranglehold on any such developments.

Mr. STRAUSS. You have very clearly chosen an item in which the public interest is so obvious and so manifest that the Commission would hardly have to go into session to make a decision.

Mr. ANDERSEN. That is as far as I care to have the discussion go. I just wanted to bring this out as an example of what might occur. I do know in the Department of Agriculture through research there we have developed wonderful inventions of great benefit to mankind. Indirectly penicillin came out of money made available to the Department of Agriculture for research. I think a little discussion of this nature in the record might be, and has been beneficial for the record in years to come to show the intent not only of the Congress, but of the Atomic Energy Commission in this regard.

Mr. STRAUSS. Thank you, sir.

Mr. ANDERSEN. Thank you, sir. That is all, Mr. Chairman.

GIVEAWAY OF ATOMIC TECHNOLOGY TO PRIVATE POWER

Chairman CANNON. Of course, Admiral Strauss, patents are not the essential thing here. Patents are merely incidental. The question before us today, judging from the testimony you and the other members of the Commission have given is that the first thing for us to do is to build these five reactors. Only by building them can we learn. Is that true?

Mr. STRAUSS. No, sir; I don't think only by building them is the only way we learn. I think the experimental and development work going on in our laboratories, Mr. Chairman, is the way that we learn the theory and the practice of this art. What we can learn from the building of the large-scale plants, however they are built—by public power companies or by private industry—is the method of reducing the cost and the more efficient operation of large-scale plants.

Chairman CANNON. We got the impression yesterday that until we built these five big reactors, each of a different type, we are marking time. That we are not really making progress until we build these five big reactors.

Mr. STRAUSS. I don't think any one of us testified that we were marking time.

Chairman CANNON. Under this third program here, the independent industrial program, in building these reactors which is the first step, they are under no obligation whatever to give the Government the benefit of anything which they discover.

Mr. STRAUSS. Yes, sir.

Chairman CANNON. It might be that they would discover some fundamental thing without which any future operation by any company would be futile.

Mr. STRAUSS. When you say these five, do you mean those in the power demonstration program?

Chairman CANNON. No. I mean the five different methods.

Mr. STRAUSS. I don't know to just what you refer, sir.

Chairman CANNON. Let me read the statement by Mr. Davis of the Commission which was submitted last December:

> The reactor experiment will supply much of the technical data needed for the design of the prototype reactor. However, the scale up from the experiments presents formidable design problems. The operation and construction of these large-scale plants will thus provide information that can be obtained in no other way.

Chairman CANNON. That is a very emphatic statement from him.

Mr. STRAUSS. That is right, sir, but that experience is not secret experience. That will be available to everyone.

Chairman CANNON. If it is developed under this independent industrial program here, the people who build reactors and who develop them will not be under any obligation whatever to reveal anything to the public or to the Government.

Mr. STRAUSS. I do not think it is fair to Mr. Davis, who is sitting here beside me, for me to attempt to interpret his remarks.

Chairman CANNON. Mr. Murray questioned me just now on this point. Congressman Murray.

Mr. JAMES C. MURRAY. I am in the area that the Commonwealth Edison Co. services. They are a very efficient company. They get more efficient as time goes on, and thereby can supply me with electrical energy at a cheaper rate. They are going into this field, I notice. With their experience in this field through their engineering skill, they will be able to develop engineering methods that are not patentable but make the cost of electricity cheaper to me.

Will their experience in that field, which is not patentable, be available to the rest of the country or the rest of the world under the present act?

Mr. STRAUSS. Mr. Murray, I think I can answer your question in this way. Obviously I can't speak for the Commonwealth Edison Co.

Chairman CANNON. The gentleman knows that the answer is "No." The books of the company are closed. That is the end of it.

Mr. STRAUSS. I believe it is the common practice in the public utility industry that their plants and their methods are an open book to everyone.

Chairman CANNON. We are not talking about the common practice. We are talking about the statutory obligation. There is no legal obligation upon them to give us a thing. Their books are closed.

Mr. STRAUSS. As I say, I cannot answer for the Commonwealth Edison Co.

Mr. JAMES C. MURRAY. You can answer for other utility companies. Is there any utility company that is under legal obligation to relay to anybody its engineering information, and information which is patentable or unpatentable, which they have gained by such experience?

Mr. STRAUSS. Unless I were familiar, which I am not, Mr. Murray, with the rules and procedures of the Public Service Commission of the State of Illinois, which I assume would control the Commonwealth

Edison Co., I could not answer. I would assume that any developments which arose from the atomic energy end of this would actually come into existence through the builders here, that is to say, the General Electric Co., and the multiplicity of subcontractors of the General Electric Co. rather than from the operating company, the Commonwealth Edison. That is my assumption but I haven't anything to base that on.

Mr. JAMES C. MURRAY. Mr. Strauss, is there any Federal legislation which would compel a public utility company that is engaging in this independent industrial program to give their know-how to the Atomic Energy Commission or to anybody else?

Mr. STRAUSS. I will have to plead ignorance there of the body of Federal law. There is a Federal Power Commission established by the Congress which has certain responsibilities and jurisdiction in this area. But I could not answer specifically as to what they might do.

Mr. TABER. Would the gentleman yield for a question?

Mr. JAMES C. MURRAY. Yes; I will.

Mr. TABER. As to contracts which you have made with these people, do they provide that that should be done?

Mr. STRAUSS. Mr. Taber, I am sorry. Would you mind repeating the question?

Mr. TABER. As to the contracts that you have made with these public utilities, do they provide that information as to methods of production of power that they develop in connection with the nuclear energy will be available to the Commission?

Mr. STRAUSS. I think an answer to that is this. Each of these reactor principles which is now under discussion in the independent industrial program is paralleled by exactly the same type of reactor in the power demonstration reactor program, and everything in the power demonstration reactor program that is discovered is the property of, or is available to the United States Government, and may be available to everyone. Is that a correct answer?

Mr. DAVIS. Yes.

Mr. STRAUSS. That is a correct answer.

Chairman CANNON. But the gentleman has not answered Mr. Mr. Taber's question.

Mr. TABER. Does that apply to these four big contractors?

Chairman CANNON. Under the independent industrial program.

Mr. STRAUSS. We do not have contracts with the companies in the independent industrial program. They obtain licenses, but do not sign a contract with the Commission. A contract implies the exchange of consideration. They ask for nothing. They receive nothing.

Chairman CANNON. You issue a license.

Mr. STRAUSS. That is right.

Chairman CANNON. You don't make a contract.

Mr. STRAUSS. That is right.

Chairman CANNON. And under that license they are not obliged to give you anything.

Mr. STRAUSS. They are not, but anything they develop we may declare affected with the public interest.

Chairman CANNON. Up until 1959.

Mr. STRAUSS. That is correct.

Chairman CANNON. After that time, unless Congress should amend the law, of which we have no assurance, the answer to Mr. Taber's question is "No."

Mr. STRAUSS. It is not an unqualified "No", sir. It is a "No", with the qualification that I attempted to inject. Also, the date 1959 was 5 years after the enactment of the law, and I presume that the legislative history will indicate that Congress must have selected that interval as a period within which experience might be gained to decide whether or not to extend it.

Chairman CANNON. The gentleman is talking about something that is not involved in Mr. Taber's question. We are not talking about patentability here. We are talking about procedure under this third program, the independent industrial program. Under this program the answer to Mr. Taber's question is No." They are not required to give one thing after the expiration of this date in 1959, or even before that date.

Mr. ANDERSEN. Unless, Mr. Chairman, the Commission finds that it is in the public interest.

Mr. STRAUSS. That is right.

Chairman CANNON. No.

Mr. JAMES C. MURRAY. No, that is only on patents.

Chairman CANNON. Under Mr. Taber's question the answer is unqualifiedly "No."

Mr. JAMES C. MURRAY. But engineering know-how can be just as important as patents as far as the public is concerned.

Mr. ANDERSEN. I agree with you, Mr. Murray.

Mr. JAMES C. MURRAY. Are you through, Mr. Taber?

Mr. TABER. Yes, I am through that. If the Commission gives a license, have you not the right to reserve to the Government the right to obtain the use of any method of manufacturing or producing that is developed in connection with it?

Chairman CANNON. Not under this program, Mr. Taber.

Mr. TABER. Do they not have the right? I think they have the right in granting the license. They can make the license conditional.

Chairman CANNON. No; not under this program.

Mr. TABER. You mean the license is an absolute license?

Mr. STRAUSS. The license requires them to observe certain standards of health and safety, and to submit the plans for their proposed reactor. I will ask general counsel, were there any other provisions in the license? Can you answer that, Mr. Mitchell?

Mr. MITCHELL. Both sections 103 and 104, Mr. Taber, which are the licensing provisions, do provide that the Commission may require such technical information and data as the Commission may determine necessary to promote the common defense and security and protect the health and safety of the public. But so far as the licensing authority is concerned, it is limited to those two areas, security and health and safety.

Mr. TABER. I think that is a pretty broad term.

Chairman CANNON. That is for the purpose of issuance of the license. It has nothing to do with getting anything back from them after the license is in effect.

Mr. TABER. Yes, but as to security, it may make any reservation that it pleases.

Mr. JAMES C. MURRAY. But it has to apply to security.

Mr. TABER. I would think if it related to security it would follow.

Chairman CANNON. No.

Mr. TABER. There is no question about that.

Chairman CANNON. Mr. Boland.

Mr. BOLAND. Admiral Strauss, what is the opinion of the Commission in connection with amending the law so that the technical know-how which might be developed by this independent industrial program after a license is issued; any information or any technical knowledge which they may develop, would be made available to the Commission, so that the Commission might make it available to others who are interested in going into this field? I can well visualize the Commonwealth Edison or the Consolidated Edison having greater technical know-how and greater brains than the Consumers Public Power District of Nebraska, and some of the others, because of their tremendous capacity to spend money or ability to get men. So they could very well develop a technical know-how which would reduce the capital costs of their plant and which would make the production of power a lot cheaper.

I think it seems to be the consensus of most members of this committee that since they have benefited because of the experience the Government has had in this field, and since the taxpayers have spent and will spend a lot of money on making this program possible, it would seem to me that any technical know-how which might be developed because of something that the Government has given to them ought to be spread out to all of those who are interested in the production of power through atomic energy. Do you think that the public ought to be protected by amending the law by adding to the specific fields that Mr. Mitchell mentioned—safety and national defense—public welfare?

Mr. STRAUSS. Mr. Boland, I am sure you must recognize the fact that in coming before the Appropriations Committee in connection with our application for operating and capital funds for ensuing fiscal year, I have not reviewed, because I did not think it was pertinent or appropriate to this hearing, the almost 6 months of debate and hearings before the Joint Committee that were antecedent to the passage of the 1954 act, and a very considerable part of which was devoted to the detailed discussion of the patent provisions.

The Commission gave many hours and many sessions to it, and so did the Joint Committee. I would be fearful of attempting to extemporize an answer.

Chairman CANNON. The gentleman from Massachusetts is not talking about patents. The admiral is bringing in an extraneous matter.

Mr. STRAUSS. We are talking about developments as a result of atomic energy and the rights of the general public to the area.

Chairman CANNON. We are talking about engineering know-how and operating experience. That is the question involved in the gentleman from Massachusetts' inquiry.

Mr. BOLAND. I don't know that I have received an answer to the question. I appreciate the fact the Commission is involved in a lot of things other than this, and I can appreciate the fact that you are not prepared to extemporize on something on which you have not prepared yourself. I think, though, it is a matter that the Commission ought to look into. I am of the firm belief that where the tax-

payers have spent the amount of money as in this program, that there ought to be some protection to the electrical power industry as a whole. The applicants for licenses who come to the Commission and spend their own money for developing their own plant without any assistance from the Government might very well develop some technical know-how which would reduce their costs. I think they have the obligation to spread that know-how to all other segments of the public utility industry because of the fact that they are benefiting from what the United States Government has done in this field.

I would like to ask this question. How did it happen that there was an independent industrial program? Was it because they were not interested at all in getting any governmental assistance?

Mr. STRAUSS. Without knowing what their individual motives were, it would appear that as they required no Government assistance, they did not come to us under the power demonstration program and simply came for a license. The motivations may have been different, Mr. Boland, in each case.

Let me ask whether the officers of the Commission who dealt with these companies put any such question to them or obtained any voluntary expression of opinion from the companies as to why they chose this course.

Mr. DAVIS. I am certainly not aware of the reasons in each case, I believe they felt that they wanted to make a contribution to the development of nuclear power, and that they felt that they could do it without going to the Government for assistance in the spirit of private enterprise.

Mr. BOLAND. You don't think they were motivated by the fact that they would go into this development on their own, and whatever they learned through the development, they would keep to themselves? That would not be the reason, would it?

Mr. DAVIS. It is my understanding that the utilities themselves do not hold patents or this type of know-how very closely to themselves, or feel that it is something that they should not spread around. I believe the manufacturing companies, although they differ somewhat in this respect, do not hold this type of information very closely or feel that it is something they should hold closely.

Mr. BOLAND. I can visualize that they would hold this information very closely if they were in competition with some public power facility as opposed to private power. I don't think for a moment that they would give the information to a public power company that might be in the area and could very well meet the competition that the private utility would be able to enter into because of its ability to reduce its costs by its know-how in this program.

Mr. DAVIS. With all of the utility companies, whether they are private or public, they go to the manufacturer to have their equipment designed and constructed. The know-how is important in the manufacturing.

Mr. BOLAND. I understand that. In the operation of it, it is conceivable that they could develop some know-how which would actually give them tremendous knowledge in reducing costs. Is that so?

Mr. DAVIS. I don't believe so. As far as the economics are concerned, which is the product of this operation, these, I believe, are very generally reported and required to be so reported by the various public utilities commissions.

Mr. BOLAND. Then, Mr. Davis, you don't believe there is any danger in the independent industrial program in developing some knowledge which it can keep to itself in reducing the costs for electric power?

Mr. DAVIS. I don't believe this will happen.

Mr. BOLAND. Thank you.

Chairman CANNON. Supplementing what the gentleman has said, and as has been emphasized here on both sides of the table, the essential thing is operating experience. That is the vital thing. Everybody knows that General Electric and Westinghouse have had the inside track from the beginning, and they would be the beneficiaries of such a program.

Mr. TABER. If the gentleman would yield to me, I would like to read another section of the act, and I would like to have the counsel follow me. Section 53, on page 12 of the act:

> The Commission is authorized to issue licenses for the possession of, to make available for the period of the license, and to distribute special nuclear material within the United States to qualified applicants requesting such material.

There is no question in the world but what the Commission would have the authority in issuing that kind of a license to require them to make available any methods of manufacture and production to the Commission.

Chairman CANNON. They have never done so.

Mr. TABER. That question has never been raised.

AVAILABILITY OF OPERATING EXPERIENCES AMONG UTILITIES

Mr. PHILLIPS. Mr. Chairman, the reason I think we may be overly solicitous at this particular moment is because we are just starting in on a development program. I think we seem to have in mind that the companies that are going to service this power, the power companies, are going to be the ones to hold patentable ideas or service ideas that would be of tremendous benefit to them.

My experience has been that they operate in a field somewhat similar to a goldfish bowl. What they do is pretty well known not only to themselves, and to each other, but to the State commissions that control them. The people we should be thinking about are not Consolidated Edison, Commonwealth Edison, and others. Rather, companies holding patents that are derived from the manufacture of equipment that utilities may want to use are the ones in which we should be interested. I have a feeling that when we set up this bill and put a 5-year limit on it, it was like the insurance problem discussed yesterday, to give us a history on it, before we decide finally what should be done.

I will ask Mr. Strauss or General Fields, isn't it a fact that these companies we are talking about do not have exclusive, secret research departments, as it were, of their own? They have joint research work. It is customarily shared with all the companies. Whether there would be, as Mr. Boland or Mr. Murray said, an exclusion between the public power and private power companies is a fair question. I think it would be an exceptionally difficult thing to enforce. If you will ask, as we have in the other committee, the engineers of TVA or of a private power company, if one has better equipment or better services, each one will say of the other, as they have in our subcommittee, "That powerplant is as good as the one we have." I think we are a little overly solicitous.

I have here a statement which is a reprint from the Electrical World. It is a page long. I will read only a couple of sentences out of it. This is a statement of Mr. James F. Fairman, the vice president of engineering for Consolidated Edison. This is what he said, and I quote.

The company felt that it has an obligation to examine the prospects of atomic energy seriously.

Then little quotes inside the other quotes—

"We wanted to start off on a free enterprise basis, because we are convinced that this is the way atomic energy will ultimately be sold. All we want from the Federal Government is to lease fuel from it."

I think we are in a sort of experimental process, and that all we have is the background of what the experience has been in the past with these things. I would not want to write into a bill yet, without that experience, a limitation which might in any way reduce the desire of any company, public or private, the manufacturer or distributor, a little town like the one in which I live, to get it by a transmission line from some central plant. I would not want to handicap them in any way in the feeling, "What is the use of our spending any money or going into this because as sure as we do, the Government will snatch it away from us." That is a general question as to whether we are not a little overly solicitous at this moment as to what may be the consequences of a patent.

LICENSES TO BUILD NUCLEAR POWER PLANTS AS DISTINGUISHED FROM PATENT PROBLEMS

Mr. Mitchell, we are talking not about patents; are we? We are talking about licenses.

Mr. MITCHELL. That is right, sir.

Mr. PHILLIPS. There is nothing in the patent law that would cover the licensing rights and the power of the Commission to do as it pleases under a license. I think it is in the patent law. Some of you lawyers ought to know. I have had a good deal to do with patents, and my experience has been adverse to any idea that you could control anything. I think the patent law protection is extremely protective for the very people Mr. Boland, Mr. Murray and I are concerned about.

Mr. MITCHELL. So far as public rights in patents are concerned, Mr. Phillips, the Atomic Energy Act does require that any application in the atomic-energy field must be reported to the Commission by the Commissioner of Patents. The Commission has an opportunity at that point to see whether the particular application did derive from something over which the Government can assert a right.

Mr. PHILLIPS. What I mean is this. Do we have to look in the Atomic Energy Act to see whether the Atomic Energy Commission has the right to put into a license or a contract, anything which it wants to put in that contact to control what happens to it after it leaves its hands? Isn't that inherent in the patent laws and licensing laws of the United States?

Mr. TABER. Mr. Mitchell, here is the point. Under the law and under the practices of the Commission, all this fissionable material is where the Commission has charge of it.

Mr. MITCHELL. That is right.

Mr. TABER. No one else has a right to possess it without a license from them, and there is nothing whatever in this section 53 that does not permit the whole thing to be covered in connection with the granting of that license. That is perfectly clear.

Mr. MITCHELL. There is certainly nothing to prohibit this.

Mr. TABER. It is absolutely possible for the Commission to refuse a license to use the fissionable material unless they comply with the things that the Commission feels necessary for the protection of the public. There is no question in the world about it. If you do not have that idea, you better get over it and find out.

Chairman CANNON. There is no basis whatever for a statement like that.

Mr. JAMES C. MURRAY. But Mr. Taber, the guides of the Commission's discretion are security and health. But the public welfare is not included in the guides for the exercise of the Commission's discretion. So I don't think under the present legislation the Commission could even require a communication of know-how. If we had a public-welfare clause in it, I think your statement would be absolutely right, but we do not.

Mr. TABER. They are not required to issue any license and that implies the authority to grant the license on conditions.

Mr. PHILLIPS. Mr. Murray, let me ask this question, because this may be one which I had not thought of before. Suppose somebody applies for a patent. He has to disclose. He cannot apply or get his patent until he discloses what he has. Can the Atomic Energy Commission use any of the information thus disclosed to the Patent Office?

Mr. JAMES C. MURRAY. I don't believe they can without being licensed by the patentee. That is my own opinion, and I am not a patent-law expert. But a patent right is property protected by our Constitution.

Mr. MITCHELL. I think that is right. As a practical matter the Government can use any patent, and then the patent owner's only recourse is to go into the Court of Claims and ask for a royalty. Certainly the Government can't use the patent if it is privately owned without compensating the owner for its use.

Mr. JAMES C. MURRAY. That is a question that I had, Mr. Phillips, on the 1959 date. If a patent was patented in this field as of today, under this clause would you have until 1959 to utilize the patent or would you have until the life of the patent?

Mr. MITCHELL. We would have until the life of the patent, Mr. Murray. This applies to applications made before September 1, 1959. So as to any such applications, the Commission has this authority for the full life of any patent that may issue as a result.

Mr. JAMES C. MURRAY. What is the effect of the termination date, then? Doesn't the termination date terminate the Government's right, or does this law continue? Is there a saving clause that continues the Government's rights until the termination of the patent?

Mr. MITCHELL. It is stated by way of an exception to the general authority, Mr. Murray. In other words, the authority to declare the patent affected with the public interest, and to require licensing is stated without limitation. Then there is a final exception that says that this power applies only to applications which have been filed prior to September 1, 1959. So the subject matter of the power is limited. But the duration of the power as to that subject matter would extend for the life of the patent.

Mr. JAMES C. MURRAY. If I made an application for a patent as of today under the present patent legislation, when would my article be patented?

Mr. MITCHELL. Assuming, sir, that there is no secrecy, and there is an unclassified area, my belief is that that currently takes from 2 to 3 years. I am not too sure.

Mr. JAMES C. MURRAY. This is 1956. If I made an application for a patent as of today, it might not be patented until after September 1, 1959. Even if we attempted to amend the law, would there not be a serious question whether it would apply to applications for a patent as of today?

Mr. MITCHELL. No, sir; the law is stated not in terms of when the patent issues, but when the application is filed.

Mr. JAMES C. MURRAY. That is all the questions I have.

POWER DEMONSTRATION PROGRAM—DOOR CLOSED

Chairman CANNON. It is my understanding that the Commission has closed the door twice, under the first round and under the second round of the power demonstration program, and no one can come in under the Commission's arbitrary determination to impose deadlines for submission of proposals. Is that not true?

(Discussion off the record.)

Chairman CANNON. I have asked this question. It is my understanding that the Commission's door is always open under the independent industrial program. Anybody can come in at any time.

Mr. STRAUSS. That is right.

Chairman CANNON. But you have closed the door under the power demonstration program at the first round, and then you opened it for the second round and closed it again, and no one can now come in under that program.

Mr. STRAUSS. Mr. Chairman, if we did not fix a terminal date under these programs, we would have no way of getting all of the proposals in in order to evaluate them. There is no intention on the part of the Commission to keep the door closed. There will be succeeding programs.

Chairman CANNON. It has that effect. The door is open, without limit of any kind, and anyone can come in under this independent industrial program under which the Goverment gets nothing. But no one can come in now under this power demonstration program whereby the Government gets the benefit of all of the experience and discoveries which may be developed.

Mr. DAVIS. We have had two rounds so far, each of them with a fixed date.

Chairman CANNON. Yes; but you have had no rounds at all with the independent people. That door is wide open, and there is no limitation on them.

Mr. DAVIS. That is purely a licensing procedure. It is my understanding that we will probably have additional rounds under the power demonstration program.

Chairman CANNON. What is the prospect of that?

Mr. STRAUSS. For one thing, we have to have appropriations to continue in the power demonstration program. The power demonstration program costs the Government money. We cannot keep the

door open and agree to make arrangements with other applicants under that program without funds.

Chairman CANNON. That is exactly why that is in point right now. That is why we are holding this hearing right now. It is in order to determine whether or not we shall provide the money and whether or not you shall open the door.

Mr. STRAUSS. Precisely. We are asking for funds.

Chairman CANNON. And if you get the funds, you expect to open the door.

Mr. STRAUSS. I do, and I think the Commission does.

Chairman CANNON. But in the meantime there is no inhibition on the independent industrial program.

Mr. STRAUSS. Certainly no inhibition on the independent program and no applicants as far as I know.

Chairman CANNON. Mr. Murray, we have all expressed ourselves here today except you. We would like to have you discuss this matter and shall much appreciate any comments you have to make.

Mr. THOMAS E. MURRAY. I have not expressed myself because I think the discussion has been pretty clear up to date. The question of developing know-how that would be important for the entire atomic industry has been something that the Commission has discussed. I do not have perhaps the fears that you may have that this know-how that will not be patentable, will be kept secret. In the case of the Consolidated Edison plant, for example, once it is built and operated, I believe all of the operating know-how of that plant will somehow or other be made public. It will become public knowledge. We might, in view of this discussion today, explore with these companies whether or not they would be adverse to giving their know-how, their operating know-how to the general public.

My personal opinion today would be that I don't think they would offer any particular objection to that. It is a point I never raised. I didn't think it had the significance that perhaps it might have in the future.

I think the way we are going at the moment is all right. I think it is a sound method to allow these companies like Consolidated Edison to come in, spend their own money and build reactors in order to help industry generally. The Government, when Consolidated Edison's reactor is built, will learn a great deal. It will be getting benefits from the building of that reactor. I do think that we have a good deal of protection under the patent clause. If the General Electric Co. or the Babcock & Wilcox Co. or whoever it is that is helping Consolidated Edison to carry on this project think it is in their interest to get up the patents on the production of fuel elements, processing of materials, then the Commission, I think, has the right under our present scheme to make that information available to the public. In other words, compulsory licensing.

I suppose fundamentally the reason we followed the course that we have followed is to give private industry full rein in this area to do the best that they could.

I personally don't see the necessity of making an issue at this time, of making it a requirement for these various companies that put up their own money that all of their know-how should be made automatically available to the public.

Chairman CANNON. Summarizing what you have said, Commissioner Murray, our objective here is to develop the know-how.

Mr. THOMAS E. MURRAY. That is right.

TIME IS OF THE ESSENCE

Chairman CANNON. It is your theory that the best way to develop know-how is by the construction of these five reactors?

Mr. THOMAS E. MURRAY. That is correct, sir.

Chairman CANNON. That our immediate program, then, necessarily would involve as quick a construction of these reactors as it is possible to build at this time?

Mr. THOMAS E. MURRAY. Yes, Mr. Chairman.

Chairman CANNON. By way of summarization, our program should be the construction of these five large reactors as the best means of developing the know-how.

ADMIRAL RICKOVER'S ROLE IN DEVELOPMENT OF ATOMIC ELECTRIC POWER

We have with us this morning Admiral Rickover. We will be glad to hear Admiral Rickover.

Admiral Rickover, will you take a place at the table, and bring your models with you.

Admiral Rickover, you come before this committee in a very favorable light. We have been led to believe that more than anyone else you have been instrumental in developing the great achievements in atomic energy, and that you have built the first atomic-powered submarine, the *Nautilus*, which has proven so eminently successful, We want to express our appreciation of the service you have rendered, and we also want to take advantage of the opportunity to avail ourselves of your counsel and advice. We trust you are in a position to help us in this problem, and that we are in a position to have the benefit of your services.

Admiral RICKOVER. Thank you, Mr. Cannon.

Chairman CANNON. The *Nautilus* has proven as fully successful as you had anticipated.

Admiral RICKOVER. More so, Mr. Cannon.

Chairman CANNON. You think it leads the way, then, to future development of atomic power in this and other relations?

Admiral RICKOVER. Yes, sir; I do.

Chairman CANNON. Very naturally, following your success with the *Nautilus*, you have been assigned the responsibility of building the reactor in Shippingport, Pa.

Admiral RICKOVER. Yes, sir.

Chairman CANNON. We would be very glad, Admiral Rickover, if you would give us a statement here this morning on the question before the committee and the Commission. I will ask you to in your own way give us the advantage of your experience and advise us as to what you think should be done, and the time in which it should be accomplished.

Admiral RICKOVER. Mr. Cannon, as I have been sitting here for the last 2 days listening to the testimony, I thought it might be advisable if I spent a few moments on why I think atomic power is important. Would you care to have me speak to that?

Chairman CANNON. We are anxious to have you develop that point.

SCIENTIFIC DISCOURSE BY ADMIRAL RICKOVER

Admiral RICKOVER. I do not have a prepared statement, and I think I can cover the subject-matter better without reference to documents or notes. With your permission I will tell the story in a natural, narrative form.

Before I get into the Shippingport reactor or any of the naval reactors, I think it boils down to three things: What the future population of the world is going to be; what the natural resources of the United States and of the world are; and more important than both of these, what are the prospective uses of energy.

As far as the population of the world is concerned, it was about 700 million people in 1750, and then by 1850 it went up to 1,100 million, by 1900 it was 1,550 million, and in 1950 it was 2.5 billion roughly. It is anticipated that by 1980 it will be about 3.6 billion, and by 2000 it will be between 4 and 5 billion. By the year 2050 it could be somewhere between 5 to 10 billion persons.

The population of the United States has increased from about 75 million in 1900 to 150 million in 1950. It may reach 225 million in 1975, 300 million in the year 2000, and 375 million in 2050. It is not generally realized that the natural increase in population of the United States is the third greatest in the world, even exceeding that of Java, Japan, and India. It is 16 per thousand. Only Brazil with 24, and Canada with 19, have higher increase per thousand than the United States.

These are tremendous increases in populations, and equally tremendous uses of materials and energy will be required to support them.

The next question is the material resources of the world. I am trying to outline this in a very brief way.

Chairman CANNON. We hope you will take all the time you require, Admiral Rickover.

Admiral RICKOVER. Yes, sir. As far as the material resources of the United States are concerned, this country has used since World War I as much of most minerals and mineral fuels as were used in all history up to 1914. If the whole world were to use mineral resources at the rate which the United States is using them today, six times the amount that is currently being used would be required.

To give you an example of how our mineral resources are dwindling, take copper:

The annual consumption of copper in this country was 23 pounds per person in 1950. Back in the 18th century ores that contained less than 13 percent copper were not used very much. By 1900 we were using copper ores that had 5 percent copper and now we are using copper ores that average nine-tenths of 1 percent, and we are even processing copper ores that contain as little as six-tenths of 1 percent copper.

What this means is that in order to get 23 pounds of copper per person in the United States we have to move a quantity of ore which is about the same as that we move to obtain all of our iron ore. In doing this we must use very large quantities of energy. What I say about copper is true of iron ore, too. In the Mesabi Range, the iron ore mined originally contained 50 percent and more of iron, and we are still getting 50 percent in some places. Within a few years we will have to get down to ores containing 25 and 30 percent, and this means that much larger uses of fuel will be required to process the ore.

Due to our using up our iron ore resources, it is estimated that by 1960 this country will be importing about 25 million tons of iron ore, and by 1975 it will be importing about 65 million tons, or 37 percent of our iron ore; again, this will require larger uses of energy.

What has happened to our energy resources? I will give you some figures which should be considered as "orders of magnitude." They are not exact figures. All of the energy which reaches this earth comes from the conversion by the sun of about 2 million tons of matter every second of time. Of that 2 million tons, the equivalent of about 4 pounds reaches the surface of the earth. Of this 4 pounds a part is reflected back into space. From this energy which comes from the sun each second, came all of the coal we have, all the oil and gas. All the plant and animal life on earth is sustained by this small part of the radiant energy intercepted by the earth. The energy which comes from the sun is about 32,000 times as much as we require to take care of all the energy we use today. Unfortunately, only a very small portion of the energy from the sun can be recovered.

For example, plants are only about 2 percent efficient in converting the sun's energy. An area of land 600 miles by 600 miles would take care of all the energy requirements the world has today if we could use it with 100 percent efficiency. This we can't do because there are clouds and there is night and large quantities of metal would be required in order to make even a very small part of the sun's energy available.

That gives you an overall idea of energy. Let us take coal, specifically. There are various estimates of the coal reserves in this country. In 1951 the Bureau of Mines estimated that the coal reserves of the United States would last about 1,500 years based on present rate of consumption. But based on the growth of population and the growth of fuel requirements per capita, the Bureau of Mines estimated that the supply of conventional fuels would be exhausted within a few hundred years.

But if we get up to a 3.6 billion population in the world—as is estimated for 1980—and if everybody in the world were to live as we do—the fossil fuel reserves would last somewhere between 230 years, optimistically, and 75 years pessimistically. With a world population of 5 billion or more these reserves would, of course, last a much shorter time.

Let us consider oil. In the next 10 years it is expected that the oil industry will spend about $115 billion, expressed in 1955 dollars, to maintain and expand its facilities. Of this $115 billion, there will be about $73 billion spent in the United States, and the remaining $42 billion in the free world.

In the last 10 years, the oil industry has spent $56 billion in expansion of petroleum facilities and about $37 billion of this was spent in the United States. These figures show how expensive it is to develop energy resources.

The results we are obtaining in acquiring new sources of fuel oil in the United States are not nearly as good as they used to be. In 1920 the dry-hole ratio in oil-well drilling was about 20 but by 1955 this was increased to 40 percent. Furthermore, the number of oil wells we are drilling in the United States has been increasing at the rate of about 4 percent per annum, while the footage drilled has increased

about 7 percent per annum. Also, in only the last 10 years the cost of finding and developing crude oil per barrel has gone up from about 85 cents in 1946 to $1.75 a barrel in 1954.

With these figures in mind, and the fact that the use of oil in the United States has been increasing annually at nearly 6 percent compounded for more than 20 years, and is increasing at more than 11 percent in the free foreign world, and the further fact that the proved oil reserves today in the United States are about 30 billion barrels, this means that within the next 10 years we must find additional large reserves of oil. You know, of course, that I am not saying our oil reserves will be exhausted 10 years from now. I am saying we will simply have to explore more and prove more oil reserves.

The total proved crude-oil reserves in the world as of 1955, were about 180 billion barrels. Of this, 17 percent, or 30 billion barrels, are in the United States; 80 percent of what is left is in the Near East oilfields. This figure highlights the importance of the Near East to the United States, particularly from a military standpoint.

I wanted to give you this broad picture of what the energy situation is, and I think in my own way this is the best way I can explain why Admiral Strauss and the rest of the Atomic Energy Commission are interested in obtaining commercial atomic power. Unless we do this, mineral shortages will develop. The better grades of minerals have already been used. We can keep on obtaining minerals, and substitutes, but at much higher expenditures of energy. When you make iron from taconite or other lower grade ores, you use much more energy than we have been using. With good iron ores that average 50 percent we use about 1 pound of coal for every pound of steel we make. But if we start using taconite, we might use 2 or even more pounds. We thus start using up more of our energy reserves. Since everybody all over the world is using more energy all the time, this becomes a sort of geometrical progression.

In 1950 there were produced about 1,250 pounds of steel for every person in the United States. By 1975 it is expected that this will be about 1,500 pounds. But you have to produce more than the difference between 1,250 and 1,500 pounds because about 1 percent per year of all the iron that is in use in the United States as finished product becomes irrecoverable because of corrosion and other reasons. It has been estimated that of the 2 billion tons of pig iron produced in the United States between 1870 and 1950 about 40 percent has been irrecoverably lost. Furthermore, when you take a certain amount of pig iron and you make steel of it, in that process of making steel you lose about an eighth of it. The larger the industrial plant gets, the more steel you need to make, not only to get ahead, but just to keep in good condition what you had before.

You can get around all this if you have ample energy sources. There was mentioned here the day before yesterday, I believe, the amount of uranium and thorium which occurs in rocks. We also have millions of tons of shale in the Chattanooga area where we can get a pound of uranium out of about 10 to 20 tons of shale. We also have millions of tons of the Green River shale in Utah and Colorado which contain about 1 pound of uranium for every hundred tons. In most granite rock there are about 4 grams of uranium and about 12 grams of thorium. The thorium, as you know, can also be made to give nuclear energy.

I am sure you gentlemen know what breeding is in atomic power—that it is the means by which we can obtain 100 percent of the energy from the fissionable material in a nuclear reactor instead of 1 to 2 percent. By means of nuclear breeding it would be possible to obtain the energy equivalent to 50 pounds of coal from 1 pound of rock. The processing of the rock could be accomplished with an energy expenditure much less than 50 pounds of coal.

It would thus be possible to obtain a net energy profit from this rock and at the same time obtain from it a variety of metals such as aluminum, iron, titanium, manganese, nickel, copper, and so on. We could gain greatly in this way. But it will take large energy sources.

Perhaps what I have said has been in the nature of a philosophical discussion, but I wanted to get this on the record to show why the members of the Naval Reactors Branch, as well as I, are interested in atomic energy. We are interested in it, not only for the Navy, but for civilian applications. Whatever we learn in naval reactors is at once useful and applicable to civilian reactors and vice versa.

If I might, I would like now to touch briefly on the naval applications.

Chairman CANNON. If you will, Admiral Rickover.

Admiral RICKOVER. When we started the atomic energy program for the Navy, the thought was that there would be civilian atomic power first, and then the Navy would come in and learn. The expression was used at the time that we would "keep our foot in the door," and we would learn to build our naval plants after civilian plants had been designed and built.

I personally didn't quite believe it that way. I thought we could develop it as fast as anybody else, by not tying ourselves too much to any particular reactor projects that were going on at the time. We have had help from the Commission and from Admiral Strauss, who was in this thing from the very beginning. They have backed us 100 percent in this thing; perhaps too much, because I don't know how they stood for such disagreeable things as they had to stand from me and some of my people. They have helped us constantly; not only the Atomic Energy Commission but the Navy, and particularly the Joint Congressional Committee on Atomic Energy. Of course, I should thank your committee, too, because you supply the money. So I thank your committee, too, sir.

Chairman CANNON. That is a very incidental service.

Admiral RICKOVER. It may be incidental, but it is essential. We started out on our own. We had very few trained people, only about 8 or 9. We selected contractors and we assisted them in training their people. Meanwhile I trained my own technical people. This training over a period of years has also included the training of officers and sailors to operate our plants. The prototype reactor plants we have operating at West Milton, N. Y., and at Arco, Idaho, are operated by our officers and sailors. We use these plants for training purposes. We run quite a number of schools of our own because there is a great shortage of scientists and engineers, and we found we could not depend too much on schools and on available training programs. We found we had to train our own people in order to get ahead. Had we depended on the state of education and training of the new people who entered our program, we could never have done our job. We

are running at the present time a number of different schools within the naval program. These schools range from the one at the submarine base, at New London, Conn., for teaching nuclear theory to officers and enlisted men, to others which teach physics and nuclear design to scientists and engineers. We are training engineers and we are training scientists. That is a constant thing that goes on all the time.

I testified concerning the naval program before the Joint Congressional Committee on Atomic Energy in 1950. Somebody reminded me a short time ago that I had said that if I were let go ahead, I could have a nuclear-powered submarine operating in 1955. That *Nautilus* plant began operating at 2 p. m., December 30, 1954. That was pretty good guessing. I assure you that it was a guess, but it did turn out that way.

The first plant, the prototype for the *Nautilus*, at Arco, Idaho, began operating in 1953. The *Nautilus*, as I have said, in 1954. The third naval plant the prototype for the *Seawolf*, at West Milton, N. Y., began operating in 1955.

(Discussion off the record.)

Chairman CANNON. The committee will stand adjourned until 2 o'clock at which time we will resume with Admiral Rickover. The rest of the Commissioners have been excused.

AFTERNOON SESSION

Chairman CANNON. The committee will be in order. Resuming our hearing, we will continue the testimony of Admiral Rickover.

Admiral Rickover is generally regarded as the most eminent authority on this subject in the world today. He has built the one reactor which has been a complete success. He is the man who built the *Nautilus*. He has been selected to build the one reactor at Shippingport, Pa., the only one being constructed up to this time. We are particularly interested in his testimony, and in his recommendations because he is not only a theoretical man, but he has secured practical results.

Will you resume, Admiral Rickover, the statement you were making at the time we discontinued?

Admiral RICKOVER. Yes, sir. I would like to go back and add some additional figures on the question of resources.

Chairman CANNON. If you will.

Admiral RICKOVER. One figure I would like to add is this: At the rate fossil fuels are being used the United States may reach the peak of its petroleum production about 1965. At that point it is estimated that even with the new reserves that come in, the amount available would decrease. It is estimated the world will reach its peak of petroleum production about 1985, because obviously since the greatest portion of the oil reserves lie outside the United States, this point will be reached later outside the United States.

It is also roughly estimated that as far as coal is concerned, if the consumption increases at the present rate and with the present rate of increase in population, we will achieve our maximum usage about 2025. That is, about 70 years from now.

Another point that should be entered in the record is what is happening in other parts of the world relative to the use of fossil fuels. In the case of Western Europe the total net expenditure for fuel imports was between $1.5 billion and $2 billion in 1955 and is expected to

increase to $5 billion by 1975. Great Britain in 1950 had a net import of 10 percent of the fuel she consumed. The major factor that keeps an industrial country such as Britain going is her coal reserves. She has no oil and she must import iron ore.

The Germans recently stated that they will from now on be a customer of the United States to buy coal. I am not talking about Russia. We don't know too much about Russia.

So you can see that there is impending in a generation or two a situation where in many parts of the world energy resources are going to be a terrific problem. If this problem of energy is not solved, our entire culture and civilization will have to be changed. We just can't keep on with this terrific increase in production, with the increasing use of minerals in the United States and in other parts of the world, without taking very significant and specific account of this energy problem.

A logical question to ask is what is in store for us if we have atomic energy. I mentioned this morning the amount of uranium and thorium which is available in most rocks, and which adds up to very large quantities. In addition, it has been estimated that the energy available in economically recoverable fissionable material is equivalent to about three times the energy available in the present reserves of fossil fuels, and that, with nuclear breeding, this would be equivalent to about 50 times the energy in present reserves of fossil fuels.

To give you a reference point, I will mention estimates of the energy resources that have already been used up in the whole world in all history.

These are rather general figures. They are "orders of magnitude." It has been estimated that up to 1850 A. D. there have been used six 9×10^{18} British thermal units (B. t. u.). I will designate 10^{18} B. t. u. as one unit. On this basis, 4 such units were used between 1850 and 1950, and it is estimated that between 1950 and the year 2000 there will be used between 10 and 20 such units.

It is further estimated that the economically recoverable reserves from all present sources of fossil fuels amounts to about 30 units (30×10^{18} B. t. u.).

I want to get those points across about population and energy to sharpen the point at issue.

SHIPPINGPORT REACTOR

With your permission, sir; I would now like to talk about the Shippingport reactor.

Chairman CANNON. You may proceed.

Admiral RICKOVER. The Shippingport reactor came about as a result of three previous unsuccessful attempts to develop power reactors. The first atomic power project, the Daniel's Pile, got underway in 1946. It was started by the Manhattan District, and the responsibility was assigned to the Oak Ridge National Laboratory. I was connected with the Daniel's Pile group. I was one of the people who were sent to Oak Ridge by the military and by industry in 1946 to learn about power reactors. That is how I got my start in this field.

Work on the Daniel's Pile went on for about a year; it was terminated by the Atomic Energy Commission because it was not sufficiently advanced technically.

The Commission could not see their way clear to backing it, because not enough technology had been developed. The facts I am stating are, by the way, from a letter of May 20, 1953, which was written by Representative Sterling Cole, who was then chairman of the Joint Committee on Atomic Energy. It was sent to Representative John Phillips, who was then chairman of the Independent Offices Subcommittee of the House Appropriations Committee.

Chairman CANNON. Which at that time had jurisdiction of this subject.

Admiral RICKOVER. Yes, sir. The second atomic power reactor project was a breeder that was being designed by the General Electric Co. It ran its course from 1948 through 1950. It was canceled by the Atomic Energy Commission in April 1950 before construction began, in part because of technical considerations, and because of excessive cost in prospect.

The third attempt toward civilian power in 1951–52 consisted of getting four groups of private companies to study the prospects for privately financed projects. This was the first attempt of the Commission to try to get industrial participation in the power reactor field. These four groups made their studies, but the answers they came up with were so inconclusive, and, as they were not willing to put up more than token money, the Commission decided it would have to go ahead on its own if a nuclear power program was to get going.

In the fall of 1952 the Commission proposed to the Bureau of the Budget that it include some construction money in its fiscal 1954 budget to start building a full-scale power-breeder reactor. This was turned down on economy grounds. Then the Commission proposed to the National Security Council that money be included in the revised fiscal 1954 budget for beginning construction of a pilot plant known as the sodium graphite reactor to produce 7,500 kilowatts of electric power. The National Security Council turned this down on the grounds of economy.

Finally, Navy plans for an atomic powerplant prototype for an aircraft carrier were reviewed by the National Security Council and the Department of Defense and were eliminated as too long term for the current budget. The so-called CVR aircraft carrier project happened to coincide with many aspects of commercial atomic power development.

Chairman CANNON. That was what year?

Admiral RICKOVER. That was in early 1953. It was then the letter was written to Congressman Phillips by Representative Cole, stating that it was the last-ditch stand from which the Commission hoped to draw the design and operating experience for stimulating private commercial atomic power development. The Atomic Energy Commission then met and designated Mr. Murray to take the matter up with the National Security Council.

He went over and put up a pretty good fight for this reactor. He got them and the Bureau of the Budget to agree that they would support an expenditure of up to $100 million for a reactor which would be built, using the pressurized-water-reactor concept which had been used in the *Nautilus* reactor. So the pressurized-water route was chosen for the reactor which subsequently became the Shippingport reactor.

We know more about this type of reactor today. No one knew then and no one can tell today which reactor type will ultimately be most economical. No one in this world can tell you that today.

Chairman CANNON. The way to learn is by building large-scale reactor plants?

Admiral RICKOVER. That is right. I will come to that later when I tell you about some of our financial and engineering problems with the Shippingport reactor.

It was finally agreed that we would build this 1 large-scale, central-station reactor of 60,000-kilowatt capacity. We chose the pressurized-water route because we had already done work along that line on the aircraft-carrier reactor which was of a size comparable to the Shippingport reactor. But the Shippingport reactor is not an aircraft-carrier reactor. It is completely different in design. The specifications which the Commission laid down when they placed me in charge of the project was that it was to be a completely civilian type of reactor. It definitely has been designed that way.

The decision having been made that up to $100 million could be spent on the project, we made an estimate of the cost and we came up with a figure of $85 million for doing the job. Of this $85 million, $47 million was to be spent in research and development and $38 million for the actual construction of the reactor.

Since the Commission wished to get as much participation by private industry as possible, a notice was put out to everybody, stating we wanted private enterprise to participate. Nine utility groups replied to this notice. The best offer came from the Duquesne Light Co., of Pittsburgh, Pa. This offer in essence provided—and I would like to repeat the provisions of the Duquesne offer although they were stated yesterday—first, that Duquesne would supply the land for the nuclear powerplant site; second, they would, at their own expense, build and operate a 100,000-kilowatt station, that is, the generating portion of the station, the turbine and generator and their auxiliaries; third, they would supply $5 million for the Government to spend as it saw fit in connection with the reactor design and development work; fourth, they would pay for the operation not only of their own portion of the plant, that is, the steamplant, but also for the pay of up to 100 people to operate the nuclear part of the plant; fifth, they would buy the steam generated by the nuclear reactor at a rate which will amount to about 8 mills per kilowatt-hour.

That is a pretty good rate. It is about what it costs Duquesne to generate electricity at their oldest station. Their most efficient station generates electricity at somewhat more than 2 mills per kilowatt-hour at the bus bar. (It should be noted, however, that this electricity will cost the American taxpayer 52 mills per kilowatt-hour at the outset. We expect to reduce this cost to 39 mills with the second core, and ultimately to 14 mills in 1967 with the third core.)

During this 5-year contract we estimate that Duquesne will pay the Government about $11 million for the steam delivered by the nuclear reactor; this is the equivalent of about 8 mills per kilowatt-hour.

The Duquesne offer was by far the best deal we were offered by any of the nine companies.

So Duquesne became partners with us. There was considerable discussion this morning on patents. I think it should be made clear for the record that the Duquesne Co. gets no patent rights of any

kind out of this. Their part is to build and operate the conventional portion of the plant, and to operate the nuclear part. There is no question of patents entering into this at all. I think you will be pleased to hear this. Everything that is developed in connection with Government funds for the Shippingport reactor belongs to the Government.

Chairman CANNON. This is the first Government experimental program, then.

Admiral RICKOVER. It is the first large one, sir. There were five reactors in this first program, as, I believe, Mr. Davis has explained. The others were small experimental units. This was and continues to be the only large-scale reactor financed by the Government.

Chairman CANNON. This is the Government's only experimental endeavor, then, on a commercial size plant?

Admiral RICKOVER. It is one of the five reactor types which the Commission decided on for this program. The other four were small units; they were reactors using different technologies. This is the only large one. It is rated at 60,000 kilowatts, which is a fair size for a central station.

Chairman CANNON. Admiral Rickover, how do you account for the fact that you were chosen to take charge of this work?

Admiral RICKOVER. I had experience with the *Nautilus*, which is a pressurized-water reactor. I think they figured I could put it through pretty fast.

Chairman CANNON. Time was of the essence of the project?

Admiral RICKOVER. They wanted to get it done fast. Mr. Cannon, you can see what a mess you could have in a tripartite arrangement between the Commission on one hand, the Westinghouse Co. which is designing the reactor on the other hand, and the private utility. I would like to say that I have never yet written one letter to Duquesne. We have been able to settle everything in a simple and informal manner. The arrangements among the three organizations have been so amicable that we have no recourse to any correspondence in regard to organizational or administrative problems. You can get everything done by personal meeting or by telephone. I would like to pay particular credit to Mr. Philip Fleger, chairman of the board of the Duquesne Light Co., and Mr. Gwilym Price, president of the Westinghouse Electric Corp., for their utmost cooperation and help. To compound the potential difficulties in the Shippingport project, we have a combined group of civilian engineers and naval officers who supervise the project. In addition, the Bureau of Ships of the Navy Department has given us considerable help in design work. All of this shows one thing. The essence of getting a job done is not the organizational form you set up. The essence is the people you have working and what their motive is. If you do that right, you don't have to worry about the organization.

Chairman CANNON. It is the workman rather than the tools.

Admiral RICKOVER. Yes, sir. If the people are determined to make a success and not be bound by a lot of redtape, they can do it. This Shippingport situation potentially lends itself to more redtape than even you people in Congress can imagine. But there has not been any.

We broke ground in 1954, but we actually did not start building the plant until last year. I think we will design, develop, and construct this plant in about the same time that it takes to build a conventional powerplant. In fact, the design of the reactor core was only firmed up a week ago last Tuesday night. All the design work is now completely finished, and we are going ahead with building it. We expect to have it in operation in 1957.

I have some sketches here I would like to show you.

Chairman CANNON. We would like to see them, Admiral Rickover.

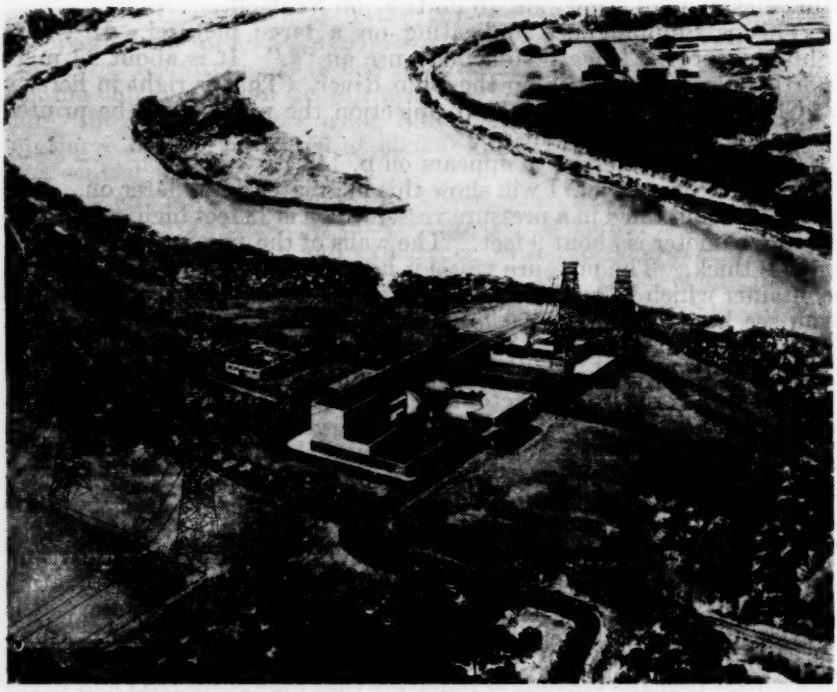
Admiral RICKOVER. I think we will have to have a lot more cooperation of this type between Government and the various segments of industry to get this job done. There is no company in this country that has enough know-how to do this job by itself.

This is Shippingport [indicating on a large picture]. It is not Shippingsport. I heard somebody use an "s." It is about 27 miles northwest of Pittsburgh on the Ohio River. That is right in here.

Chairman CANNON. Without objection the picture will be printed in the record at this point.

(The picture referred to appears on p. 148.)

Admiral RICKOVER. I will show this in greater detail later on. The reactor is contained in a pressure vessel which is 33 feet high, and whose inside diameter is about 9 feet. The walls of the pressure vessel are 8 inches thick. The pressure vessel is housed in a 1-inch thick spherical container which has a diameter of 38 feet. The cylindrical containers you see here are about 100 feet long and about 50 feet in diameter. They are the largest containers of this type that have ever been built. There are three of them and they contain the heat exchangers and the pumps and all the other reactor auxiliaries we use. The idea of having these pressure containers is in case anything goes wrong with the reactor. Their volume is large enough to withstand the pressure that could be generated by releasing all of the water in the reactor plant. We have kept the Pennsylvania State Department of Health and the Ohio Valley Sanitary Commission, composed of representatives from all the States bordering on the Ohio River, fully informed of the safety and radiological aspects of the plant. We have had excellent cooperation from them. An officer of the United States Public Health Service is stationed at the Pittsburgh Area Office of the Atomic Energy Commission and devotes full time to the Shippingport reactor problems. We expect that the amount of radiation that may enter the Ohio River will be less than one-tenth of what the National Bureau of Standards considers permissible. In addition, we have obtained approval for our pressure vessels and containers, as applicable, from the State of Pennsylvania Department of Labor and Industry.



Artist's conception of the Shippingport atomic power plant (PWR).

Incidentally, it has been our experience with the *Nautilus* that the average radiological exposure of her crew over a period of a year and a half has been less than one-tenth of what the Atomic Energy Commission allows in its laboratories. Occasionally the *Nautilus* discharges small amounts of radioactive water into New London Harbor. But there is so little radioactivity in it that it doesn't have any effect on the use of the water even for drinking purposes. We have kept the State of Connecticut Department of Health fully informed of all we do with the *Nautilus* in this connection.

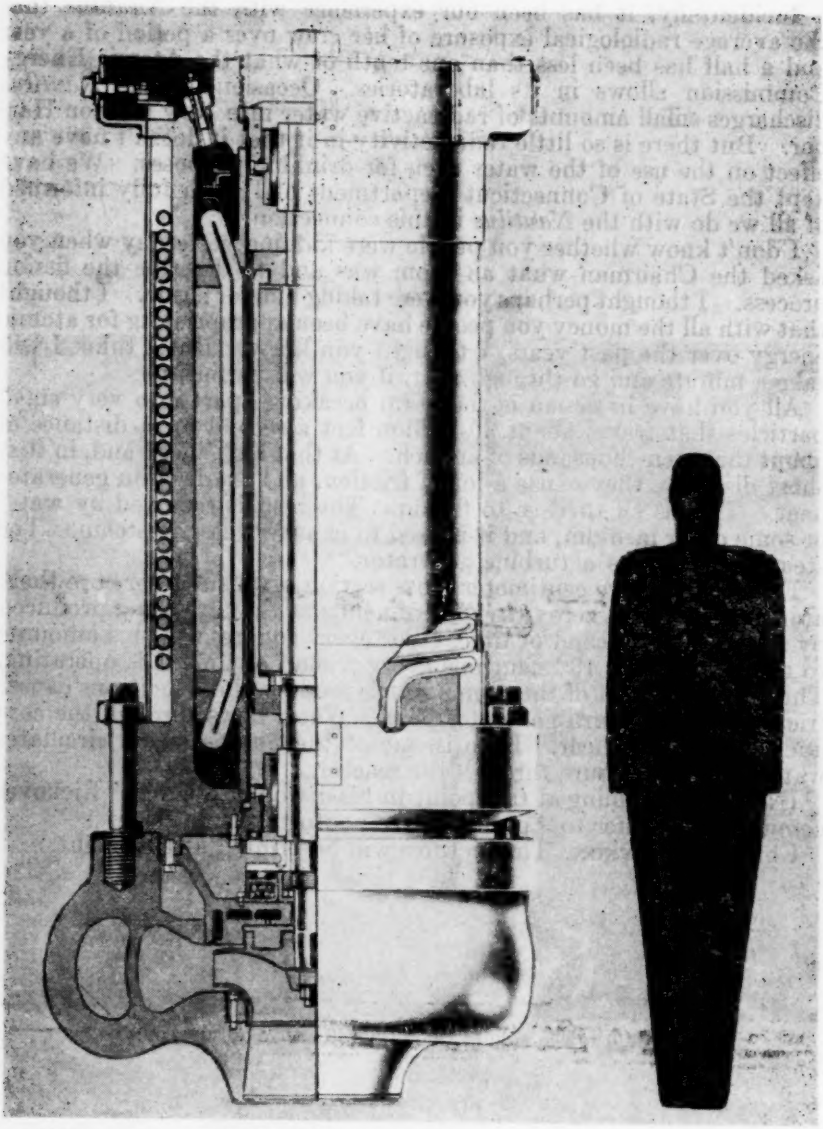
I don't know whether you people were kidding yesterday when you asked the Chairman what an atom was and to describe the fission process. I thought perhaps you were taking him for a ride. I thought that with all the money you people have been appropriating for atomic energy over the past years, I thought you knew. But I think I will take a minute and go through that, if you will permit me.

All you have in fission is the atom breaking apart into very small particles that travel about 30 million feet a second for a distance of about three ten-thousands of an inch. At that high speed and, in that short distance, they cause a lot of friction, and the friction generates heat. That is all there is to fission. The heat is removed by water or some other medium, and it is used to change water to steam. The steam then drives a turbine generator.

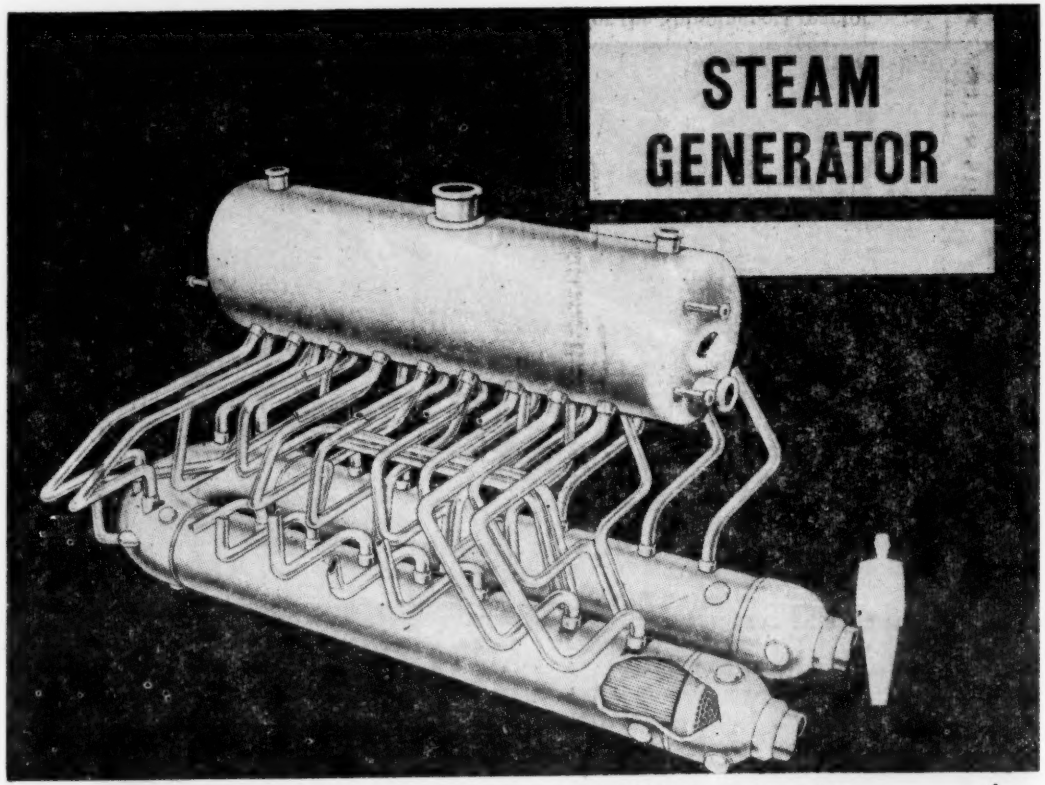
For every square centimeter cross section of this reactor core there are 10^{14}—1 with 14 zeros after it—of neutrons that are being produced by fission every second of time. For every square inch this amounts to about 6.4 times 10^{14} neutrons every second of time it is operating. The breaking apart of the atoms which produce these neutrons causes friction which in turn generates heat. Water flows through the core and removes the heat. Here is one of the pumps which circulates water at high pressure through the reactor.

(NOTE.—Beginning at this point in his discourse, Admiral Rickover commenced to refer to a group of five photographs.)

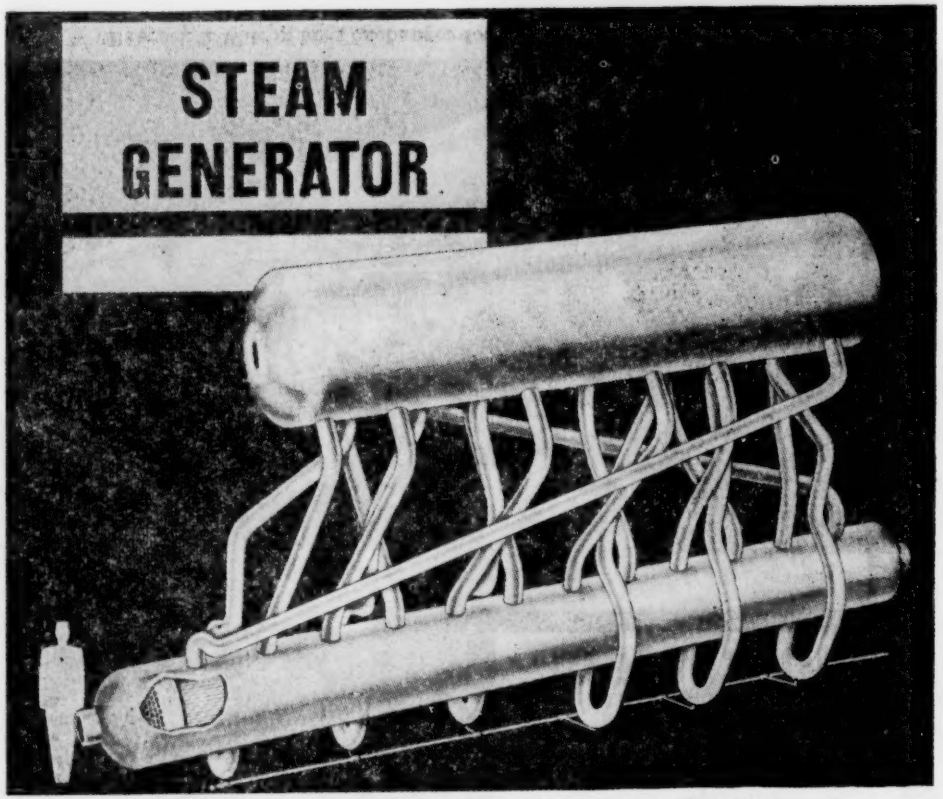
Chairman CANNON. The pictures will be printed at this point.



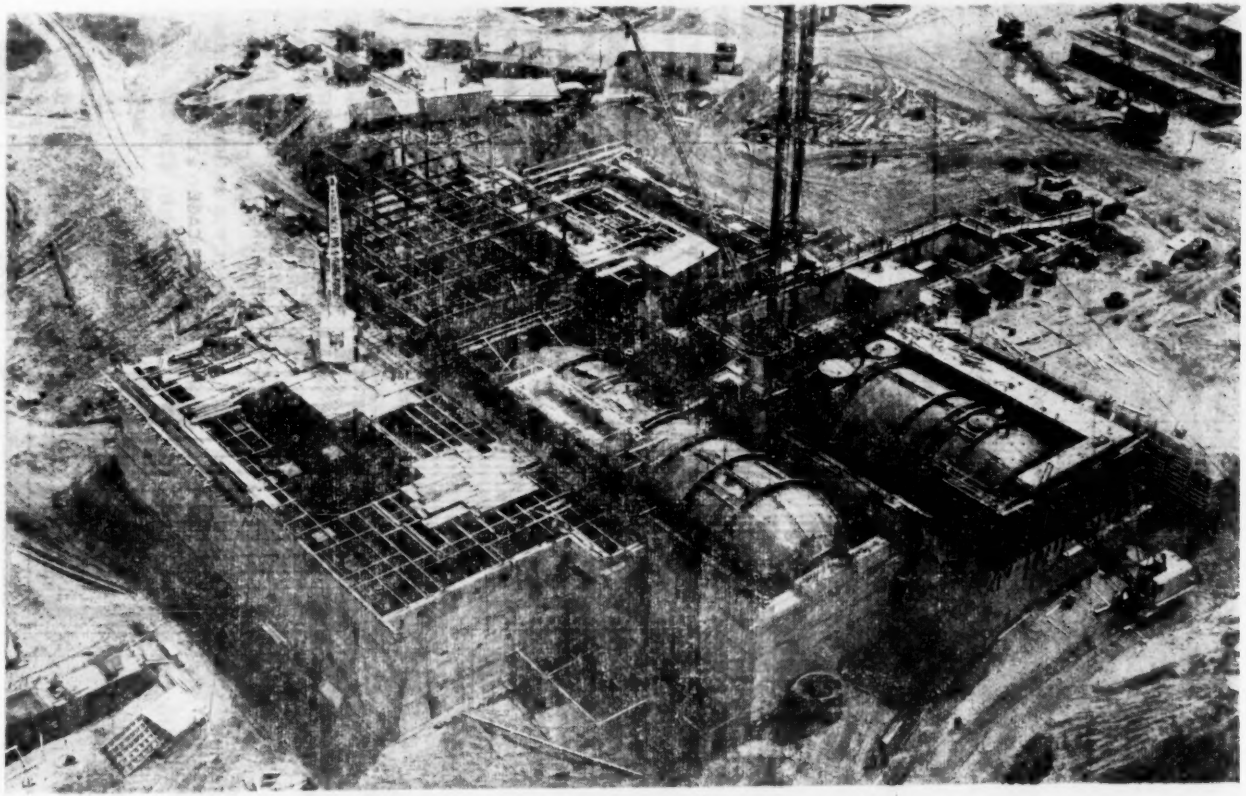
1,000 horsepower, 16,000 gallons per minute canned rotor pump for the Shippingport reactor.



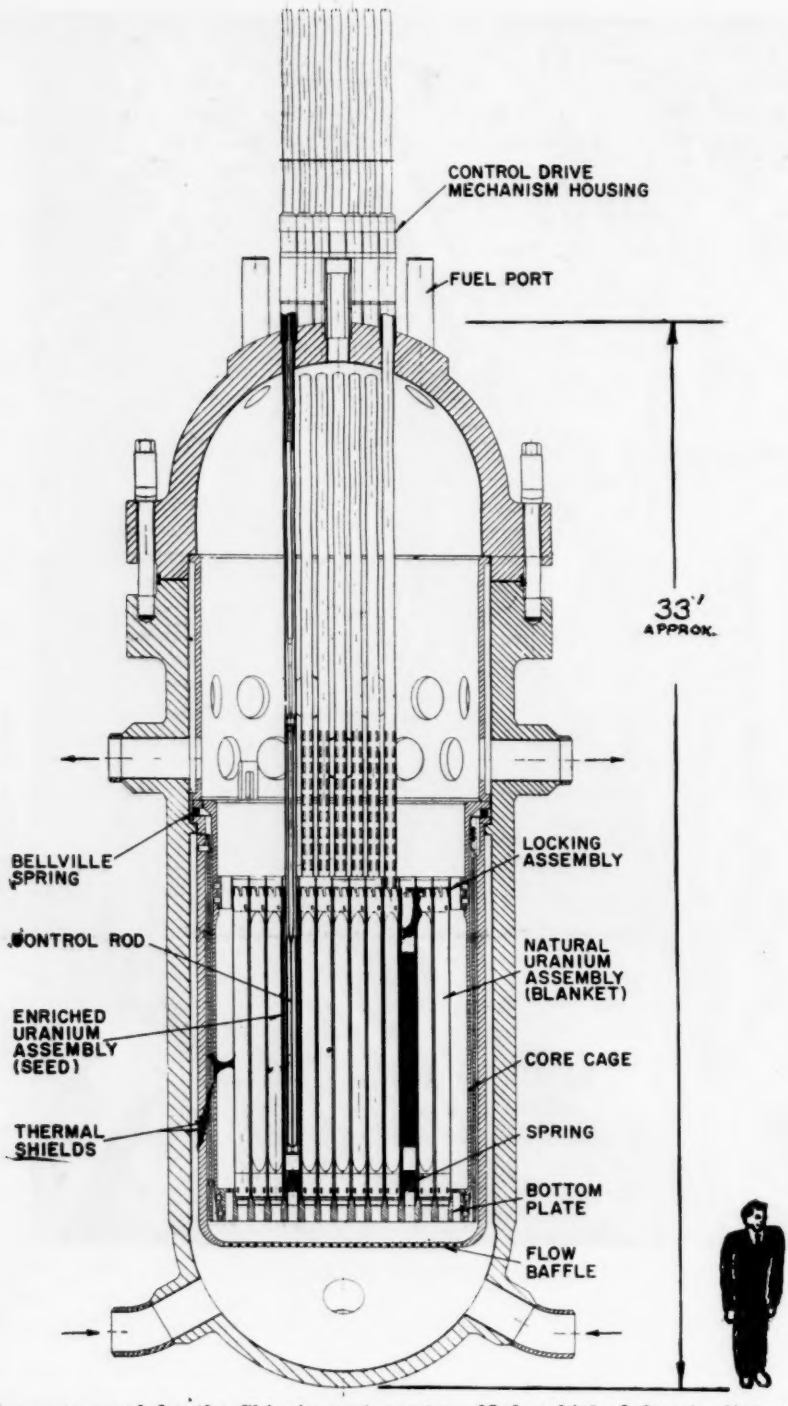
Babcock & Wilcox heat exchanger for the Shippingport reactor.



Foster-Wheeler heat exchanger for the Shippingport reactor.



General view of the Shippingport atomic power station.



Pressure vessel for the Shippingport reactor—33 feet high, 9 feet in diameter, 8 inches thick.

Admiral RICKOVER. This line shows one of the tubes of the heat exchanger [referring to tubes shown in cut-away section of Babcock & Wilcox heat exchanger]. The radioactive water from the reactor goes through this tube—there are many such tubes—and thus heats up water on the outside of the tubes. That water on the outside of the tubes becomes heated and changes into steam. The steam then drives the turbogenerator. But there is never any direct contact between the high-pressure radioactive water which is inside the tubes and the water which surrounds the tubes and is changed to steam.

The point is that there is no direct connection between the water which goes through the reactor and the steam.

This is the same picture that Admiral Strauss showed you yesterday [referring to picture showing general view of Shippingport atomic power station]. There are about 4,700 tons of steel in this plant and about 45,000 cubic yards of concrete. This gives you the idea that it is not a small plant.

In this container is installed the reactor pressure vessel. This shows you 2 of the heat exchangers which are contained in 1 of the 100-foot long and 50-foot diameter enclosures. There are two more heat exchangers in a similar enclosure. Here is the reactor pressure vessel [referring to the last picture]. It is 33 feet high. For comparison, standing alongside is a standard Navy man, 5 foot 6 inches tall. The pressure vessel is 8 inches thick and 9 feet across. The reactor is down here. It is 6 feet in diameter and 6 feet high. The reactor core contains about 75 kilograms of enriched U–235 and about 14 tons of natural uranium.

The PWR reactor pressure vessel is considered the most difficult pressure vessel that has ever been made in the United States. It was manufactured by Combustion Engineering.

This shows 1 of the 4 main pumps [referring to the first picture]. These pumps are known as "canned rotor" pumps. We developed them for the *Nautilus* in a smaller size. We have run pumps in tests for more than 10,000 hours. In fact, those on the *Nautilus* have never been opened up. They are completely enclosed.

The pumps are lubricated by the water they pump. You cannot use oil because oil would contaminate the water in the reactor. We had to develop pumps that would be self-lubricating. This one I am showing you is a thousand horsepower pump. It pumps 16,000 gallons of water per minute at 2,000 pounds pressure.

This shows one of the heat exchangers [referring to the third picture]. It is 1 of 2 made by Foster Wheeler; there are 2 others that were made by Babcock & Wilcox.

Mr. ANDERSEN. Admiral, give me an idea how you made this pressurized water.

Admiral RICKOVER. How it works?

Mr. ANDERSEN. How you create it?

Admiral RICKOVER. We have a pressurizer tank in the system—which is partly full of water. Electrical heating coils heat the water in the tank. You start heating up this tank and pretty soon you build up the pressure. You can get any pressure you want. We operate at 2,000 pounds.

There is 2,000 pounds of pressure on the system. The reason we have this pressure is that you don't want the water in the reactor primary system to be a mixture of water and steam because it would be difficult to control the reactor. The pressure has the same effect

as if you had steam and you put high pressure on it, and forced it back into water. But there is still the same amount of heat in it, whether it is high-pressure water or steam. So if you put water around the tubes of the heat exchanger through which it flows it will absorb the heat and you then permit this heated water to flash over into steam. The steam pressure in the Shippingport reactor happens to be at 600 pounds pressure.

Mr. ANDERSEN. Thank you, sir.

Admiral RICKOVER. I will show you how a particular fuel element is constructed. This sample is an actual fuel element for the Shippingport reactor. In this particular reactor we use uranium oxide. It is a dark brown powder. If any of you gentlemen care to, I can take these samples out later and show them to you. Uranium oxide is the basic material. Instead of using metallic uranium we are using uranium oxide.

The reason we use uranium oxide is because once a metal is in the form of an oxide—as you know, water has one part of oxygen and two parts of hydrogen—it can't chemically absorb any more water. This means that if for any reason the zirconium tubes which contain the uranium oxide pellets were to crack and expose the oxide to the water passing through the reactor, not much would happen because it has no affinity for—it is incapable of absorbing—water. It is in reality uranium which has become completely rusted. Being completely rusted, it can't rust any more. That is why we chose uranium oxide.

We take this powder, this uranium oxide, and we compress it into small pellets that you see here. Then we put a number of these pellets into one of these zirconium tubes. Then we take about 100 of these tubes and assemble them into a honeycomb and end up with 1 of these fuel assemblies; 7 of these fuel assemblies are stacked in the reactor, one on top of the other, and quite a number are required for the entire reactor core. The water passes through the interstices between the tubes, then goes through the heat exchanger, and imparts its heat to the water that is surrounding. That is how the steam is made. That is all there is to it. That is all you have to know to be a nuclear engineer.

Mr. PHILLIPS. What is that compared to natural size?

Admiral RICKOVER. This is full size. This is the first one we made. This is a real one.

Mr. PHILLIPS. Then the 6-foot one is just piled up?

Admiral RICKOVER. Yes, sir. They are piled up one on top of another up to 6 feet. This is a real one. This is pretty heavy. You better not try to lift it.

Mr. RABAUT. How much power is in this particular one?

Admiral RICKOVER. I don't know exactly how many of these units there are in the reactor core. Seven units stacked, one on top of the other, make up one 6-foot fuel element. There are about 110 fuel elements in the reactor, so that roughly there are about 770 individual units. This reactor puts out 60,000 kilowatts net electrical power besides supplying the power for the pumps and all the other station auxiliaries. That 6-foot by 6-foot core puts out 60,000 kilowatts net of electricity.

Mr. RABAUT. Are you having much touble with the metal in which this water is kept?

Admiral RICKOVER. Yes, sir. If you have a lot of hours I will tell you my troubles. I will tell you some of those things. I would like to go on, if I may.

Mr. RABAUT. You go on with your own story.

Admiral RICKOVER. I think I can talk longer than you can listen on this subject, because I am very much interested in it.

Chairman CANNON. There is absolutely no time limit, Admiral.

Admiral RICKOVER. I hope if you don't understand anything I say you will ask me, because you really should have a good concept of this.

We did have a lot of problems, and we still do have. When I left here this morning, Dr. Libby said, "Why don't you tell the committee about your problems with stainless steel?" We have been using stainless steel in this country for 30 to 40 years, and yet just recently when we came to try to anneal stainless steel tubes for heat exchangers we found out that no one in the United States we could find knew how properly to anneal stainless steel tubes.

We use stainless steel tubes in this heat exchanger. There is a condition known as chloride stress corrosion. There is a little salt in all waters, even in land water. That can cause stainless steel tubes to crack. We actually have had to engage in fundamental research to find out how to anneal stainless steel tubes.

This is a surprising thing, but it is typical of many, many problems that we are encountering in the reactor game. I have expressed it this way: Our state of technical knowledge today has reached a certain level. The technical complexities and difficulties we encounter in the reactor field are forcing us to penetrate into a still higher level of technology. This is the real reason why industry should get involved in atomic energy, if for no other reason than from their own selfish standpoint. And not so much because they will develop atomic power, but because, I believe, otherwise they will not become familiar with all this new technology and learn in time. If they don't learn, they will remain behind a moat of inferior technology, and they will fall by the wayside. It is those companies that are smart enough to get into this game and learn that will have a tremendous advantage over their competitors, not alone because they will be building nuclear powerplants, but also because we have to use so many new materials and new processes, and because we have to use existing materials under extremely difficult conditions that we are learning a great deal about all kinds of technology. This is the story I tell companies that are thinking of entering into the reactor game.

DEVELOPMENT OF COMPETITIVE SOURCES OF SUPPLY

Incidentally, I want to make an additional point; it does not relate directly to the PWR program; it relates more to the naval program. As you gentlemen well know, the aviation industry was started as a fully Government supported industry. As I read from some of the congressional hearings, about 99 percent of all the facilities they have are paid for by the Government. I have started the procedure in the naval reactor program wherein every dollar of the cost for the manufacturing facilities is paid for by private industry. Not only that, but we are buying our material on competitive bidding. We are in the process of ordering the complete nuclear components for five

submarines. Out of about $20 million obligated to date, 88 percent of it was obtained on strictly competitive bidding in facilities put up by the companies themselves, and only 12 percent was obtained noncompetitively, and these 12 percent only because we had not yet been able to develop competitive sources of supply.

We are developing these sources of supply, and I hope within a year or so that nearly 100 percent of all the materials we buy for naval nuclear powerplants can be bought on strictly competitive bidding in facilities which are owned by the company, and for which they do not obtain a certificate of necessity to permit rapid tax amortization.

I thought you would like to know that we are taking this approach in the naval reactor program and that we are not starting this new industry off as being a Government supported industry.

Mr. RABAUT. Is there a wide range in the prices?

Admiral RICKOVER. Yes, sir. Sometimes they are 4 or 5 to 1. It is very easy to deal with congressional committees if all you have to do is say "I bought it on a competitive bid." You don't have to explain.

Mr. RABAUT. I understand that, but there really is some advantage in competitive bidding; it is real competitive bidding.

Admiral RICKOVER. Yes, sir. We should use competitive bidding wherever possible. We also have a good record in small business. Last year the United States Senate Select Committee on Small Business reported that during calendar year 1954 the Westinghouse Electric Corp., in the submarine reactor program subcontracted 62 percent of total dollars to small business, which approaches 90 percent of the small business potential. So we are looking out not only for competitive bidding, but we watch the contracting also to try to give as much chance to small business as possible. We do want to spread this knowledge around. It must be done.

Chairman CANNON. Apparently you are including some classified material—for example, when you mentioned the amount of steel for five submarines.

Admiral RICKOVER. I mentioned the amount of steel for the Shippingport reactor. So far I have said nothing classified.

Chairman CANNON. We hope to have nothing classified here, because we expect to make this public.

Admiral RICKOVER. I appreciate your bringing this to my attention.

Chairman CANNON. Subsequently, if there is some classified material you would like to submit to the committee, we will take that in detail.

Admiral RICKOVER. Thank you very much.

To go on with the Shippingport reactor—I will talk about the competition. We put practically all parts of the reactor plant, except the core, out on competitive bidding. We put the pressure vessel out on competitive bidding. We put the heat exchangers out on competitive bidding. We used the occasion to develop three sources of supply for canned rotor pumps so that we would, in the future, be able to have competitive bidding.

We are now, as a result, buying all of our reactor pumps for all nuclear-powered naval vessels on competitive bidding.

Since I have been doing all the talking and you people have had more experience in this business field than I have, I would appreciate it if you would ask some questions.

Chairman CANNON. We wish you would continue. It is a very informative session.

Admiral RICKOVER. I think you are interested in costs.

Chairman CANNON. As I understand it, you have three cores at Shippingport?

ATOMIC POWERPLANTS

Admiral RICKOVER. I will explain that, sir. The question has come up about competitive atomic power. In my opinion, there will certainly not be any atomic power anywhere competitive with conventional sources for 10 years. I mean it is very foolish in this scientific age to predict what is going to happen more than 10 years from now. So I don't have an answer subsequent to that time.

Recently I made a study of about 50 prospective nuclear powerplants which the people claim would produce power at about 7 mills per kilowatt-hour. They all come out 7 mills, no matter whether it is a 1,000-kilowatt reactor or a 100,000-kilowatt reactor, whether it is cooled by gas, whether it is cooled by water or by liquid metal. No matter what you do the answer always comes out 7 mills. It always comes out about what electricity costs when produced from coal. It almost looks as if the people, knowing what the price of coal is, use this figure for their prospective atomic powerplants. It is like knowing the score of a baseball game first, and then you play it.

There are only two reactors, the Shippingport reactor and the Army package power reactor for which we are even beginning to get actual cost figures. Their power costs will be several times 7 mills. I make this point because I don't think you are going to get competitive power in the next 10 years. I made a similar statement in 1946. I had a study made at that time, when I first got into this program, and I think that statement still holds. You can give anyone his fissionable material free, and I say for the next 10 years he could not compete with a conventional plant. He still could not make it come out to 7 mills. This is my statement and I will stand by it.

Chairman CANNON. Do you include in that statement, Admiral Rickover, foreign countries having a higher fuel cost than we have in America?

Admiral RICKOVER. Yes, sir.

Chairman CANNON. It applies everywhere? You don't expect to develop competitive commercial power in the next 10 years?

Admiral RICKOVER. Sir John Cockcroft, the British nuclear scientist, was in Mr. Davis' office a short time ago, and I discussed it with him. He said they would have competitive atomic power in England in 5 years. I told him he was completely mistaken. You can always make it come to a low cost, depending on what kind of figures you use. I could make your suit cost $1 if someone gave you the cloth and the work free. The way they get these costs down low is this way: The British are producing plutonium in their reactors. It all depends what price you assume you get for plutonium. If you double the price for that you cut the cost of power down.

(Discussion off the record.)

Admiral RICKOVER. They have a strong imagination and they are very much interested, and we are all interested in getting ahead with this job. Sometimes I think people who are very much interested,

and who have not had to face up to certain economic realities tend to be too hopeful. That is all right.

(Discussion off the record.)

Chairman CANNON. You may proceed.

Admiral RICKOVER. I think these people believe it, but I don't think the figures that they have jibe with all the actual facts of the case. For example, it cost over $4 million to develop this fuel element. Let me show you something else here to give you an idea.

This is a zirconium tube. I will talk a little bit about zirconium to give you an idea why this game costs a lot of money. When we started out with the *Nautilus*, zirconium was costing about four or five hundred dollars a pound. We finally developed it at the Bureau of Mines at Albany, Oreg. We were then able to enter into a contract with the Carborundum Co. for 5 years where we could obtain zirconium sponge for about $13 a pound. This year we have made additional contracts with 4 companies to make zirconium sponge for us for the next 5-year period, and we will get it for about half this price. I think you are familiar with the titanium process. Zirconium is made by a generally similar process. But titanium is being made in much larger quantities. The zirconium price will not be too far off from the cost of titanium.

We had to learn how to extrude zirconium tubing. We used zirconium because it is highly resistant to corrosion. It is far better in this respect than stainless steel. Further, it does not absorb neutrons to the extent stainless steel does. In a reactor we want a structural material which does not absorb neutrons and which has high tensile strength, can be readily worked, but still is corrosion-resistant to high temperature water. Zirconium meets these requirements.

We had to learn how to extrude zirconium tubes. No one in this country knew how to do this. I would say it cost us about $2 million to develop this tube I am showing you. That is where the high cost enters the reactor game. It costs us about $7 to extrude 1 foot of this tubing. After we give a man a chunk of zirconium, we still have to pay, today, $7 for the extrusion cost per foot. But all the other people, such as Consolidated Edison and Commonwealth Edison who will follow, will benefit by our experience, and obtain their pumps, their zirconium, and so on, cheaper. But you have to do this on any new type of reactor. Somebody has got to step in and pay this cost. I don't think that any private company is going to pay this kind of cost.

INSULATION OR SHIELDING OF REACTORS

Mr. RABAUT. I would like to ask a question. What about the insulation of this? Has that not always been a big problem?

Admiral RICKOVER. There is no such thing as insulation here. The core is installed inside a pressure vessel.

You mean to keep the outside safe?

Mr. RABAUT. Yes.

Admiral RICKOVER. You do insulate it the way you would everything else that had that temperature.

Mr. RABAUT. Don't you have considerable weight in the insulation?

Admiral RICKOVER. You mean the shielding, sir?

Mr. RABAUT. Whatever you call it.

Admiral RICKOVER. Yes, you do.

Mr. RABAUT. Isn't that still a big field of research.

Admiral RICKOVER. It is not a big field for research in a land reactor for this reason: Do you mind if I give you a fundamental lesson in this so you will understand? The radiation problem comes from two factors, neutrons and gamma rays. The neutrons stop when the reactor stops. You only have to worry about the neutron radiation while the reactor is running. The mass of a hydrogen atom is about the same as that of a neutron. Therefore, if you have about 3 feet of water in a tank outside of the reactor pressure vessel—and that is what we do—we surround the pressure vessel with water. The water, of course, consists of hydrogen and oxygen. The hydrogen atoms in this tank of water slow down and finally stops the neutrons. I think that the shielding is so good that only 1 out of about every 30 billion neutrons gets outside of that water tank.

Now, I come to the second part of the radiation, the gamma rays. The reason I have split the shielding problem into two parts is because we actually solve the problem in two distinct parts. We took care of the neutrons by placing three feet of water around the reactor pressure vessel. That stops the neutrons. But for gamma rays we need mass. For instance, about a half a mile of air roughly has enough mass to stop gamma rays. But a few inches of lead will also stop them. So will 5 feet or so of concrete. It is entirely a case of mass, and we have not been able to learn any simple way of stopping gamma rays other than by mass.

In a submarine reactor plant where space is very tight we use lead, but for a shore plant such as Shippingport, we could, if we desired, just pile sufficient earth around it, perhaps 10 to 15 feet. That would stop the gamma rays emanating from the reactor. Actually we are using about 5 feet of concrete. This is why when you see pictures of the Savannah River plant, or the Hanford plant, you see these huge masses of concrete because it is the cheapest way that we know of stopping the gamma rays when there is plenty of room to play around in.

Mr. RABAUT. The first time I saw it was at the Bureau of Standards years ago. They had it in a little wheel truck. They had it all in lead. Then they would put something on top to show it was leaking.

Admiral RICKOVER. The reason they had the lead was because they wanted it to be small. If they didn't care about size or portability they could have made it of concrete, but it would have been 5 feet thick instead of a few inches of lead.

Mr. RABAUT. With the volume that has to be around it, and the weight, that makes it quite far removed from any kind of propulsion for an automobile.

Admiral RICKOVER. Yes. There is still another better reason. Shielding follows what is known in mathematics as an exponential law. It means this: If I can shield something with 5 feet of concrete, and I want to make the shielding twice as effective, I need add only one-tenth of the present thickness of shielding, or one-tenth of 5 feet; that is 6 inches. Suppose with a 5-foot-thick concrete shield, 2 units of radiation escaped from the shield every second. By adding 10 percent to the thickness, or 6 inches, only 1 unit of radiation would escape. That means even if you have a small plant you have to have a large amount of shielding. Roughly speaking, the thickness of the

shield has little relation to the power of the plant. Little plants require almost as much shield thickness as the big plants. That is what makes it difficult to atomic power an automobile with our present state of knowledge.

Chairman CANNON. I got the impression you said that Duquesne was rendering a public service at considerable sacrifice.

Admiral RICKOVER. I don't believe my words were quite as strong as that.

Chairman CANNON. I may have misunderstood that. In 1957 you start production of nuclear electricity with the first core. You tell us that the electricity produced by this first core will cost 52 mills.

Admiral RICKOVER. Yes, sir.

Chairman CANNON. The second core, when it is put into effect, will produce electricity at a cost of 39 mills.

Admiral RICKOVER. Yes, sir.

Chairman CANNON. And the third core which involves 10 years, I believe, will produce electricity at a cost of 14 mills.

Admiral RICKVER. Yes, sir.

Chairman CANNON. But Duquesne all during this entire 10 years is only paying 8 mills whether the electricity costs 52, 39 or 14?

Admiral RICKOVER. Yes, sir. But Duquesne could have put up a new steam plant of their own where they would have gotten this electricity for about 2 mills, instead of 8 mills.

Chairman CANNON. That is exactly what we want to know. Are they at some financial sacrifice rendering a public service here, or does their enterprise pick up a profit, passed on to its consumer in the rate base?

Admiral RICKOVER. Of course, they have a utility commission, sir, and their rates are set. I think most utilities are guaranteed a specific return on their investment. I don't know how far you can go away from that aspect in the utilities business.

Chairman CANNON. They do include the expenditure in their rate base?

Admiral RICKOVER. I think they do, sir.

Chairman CANNON. And therefore they suffer no loss. If anything, they enjoy an advantage. That is the point. They put this in the rate base and pass it on to the consumer.

Admiral RICKOVER. Mr. Cannon, I don't know where you can draw the line on this. I can point out some of the mistakes you may have made in tax legislation, sir. Look at the whole tax structure. Doesn't a lot of industry work on the basis of a tax structure? Don't they do a lot of things which are based on a particular corporation tax structure or income-tax structure? Where do you draw the line? If you start delving into this thing a good deal you can find all kinds of things that are done as a result of indirect or direct Government benefits. I don't know in our vast technological economy how far you can carry this.

Chairman CANNON. Let us take the testimony of Benjamin Sigal, general counsel of the International Union of Electrical, Radio, and Machine Workers. Here are some of the pertinent questions:

How much of the private investments will be subject to fast writeoffs for income-tax purposes? The $5 million contribution of Duquesne Light & Power Co. toward the Shippingport reactor has been certified by ODM for writeoffs of $4 million in 5 years against Federal income tax. It has also been certified to a

writeoff of $6,375,000 of the $9 million it proposes to invest in the nonnuclear portion of the plant. Thus 75 percent of the total private investment will be recovered in 5 years. These fast writeoffs are in effect interest-free loans from the Government.

(Discussion off the record.)

Chairman CANNON. To what extent will utility investments in nuclear reactors be charged to current operating expenses? Of the $45 million which Nuclear Power Group, Inc., proposes to invest in its reactor, $15 million is to be charged to operating expenses for research and development. In that form it will not be subject to income taxes.

Of equal or greater importance is the fact that this device will enable the utilities to use these expenditures to justify the continuance of their present rates for electrical power, or support a demand for an increase in these rates.

Would you say that is true?

Admiral RICKOVER. As far as I know, this is true. You understand, sir, that I have not been involved in the Nuclear Power Group project. I have heard this, but this is hearsay evidence.

Chairman CANNON. This is outside of your field?

Admiral RICKOVER. Yes, sir; it is outside. I appreciate the fine way you have been treating me in letting me talk this way because I can do better with this freedom.

Chairman CANNON. We are very anxious to have you give us everything you want us to hear. The committee must go to the floor to vote.

(Short recess.)

Chairman CANNON. Admiral Rickover, our program is shot to pieces this afternoon. We had not expected these two rollcalls to interrupt. A number of us are due at a preconference meeting at 4 o'clock. We are very anxious to hear you in full. I wonder if you would be with us again in the morning at 10?

Admiral RICKOVER. Could it be some other day, sir? I am to be up at Woods Hole, Mass., tomorrow morning to talk with a group of scientists who are considering naval problems. If at all possible, I would appreciate if it could be on any other date?

Chairman CANNON. Could we let you know?

Admiral RICKOVER. Yes, sir. I am very appreciative of you giving me this consideration.

Chairman CANNON. Without objection the committee will stand adjourned until 10 a. m., tomorrow, and we will hear Admiral Rickover either the latter part of this week or the first part of next week. Will that be agreeable to you?

Admiral RICKOVER. Yes, sir.

Chairman CANNON. We will notify you.

Thursday, June 28, 1956

DIFFERENT TYPES OF REACTORS

Chairman CANNON. The committee will be in order.

Continuing the hearings on the budget for the Atomic Energy Commission, Admiral Strauss, we have been impressed by the number of different types of reactors, the construction of which you are considering.

Why do you suggest the construction of many types rather than settle on the one which seems to be most promising for our purpose?

That is, the one which will produce in the shortest time possible power for commercial purposes at competitive rates?

Mr. STRAUSS. For the reason, Mr. Chairman, we do not know which type that is.

The situation is somewhat analogous to that which was followed by the government during the very early stages of the atomic energy project when it became necessary as a preliminary step to separate the fissionable isotope, uranium 235, from normal uranium.

There were four different processes conceived and they were carried on in parallel for a considerable period of time until finally two of them were dropped and the remaining two were carried through to completion before it was discovered that the gaseous diffusion system was the best, was the optimum method.

We do not know which of the existing reactors offers the most promise for economical electrical kilowatt production and the only way for us to discover which is best is by exploring them all and that we continue to do.

It is also possible that since electric plants vary in their installed capacity from a few thousand to many thousand kilowatts, we may find, probably shall, in the course of our work that one type of reactor is more efficient as a small plant, and another type most efficient as a large one.

I believe that is the answer, sir.

Chairman CANNON. You construct not only a large reactor of each type, but also a smaller pilot plant of each type?

Mr. STRAUSS. Yes, sir. Of each type we expect to construct and we are constructing an experimental pilot prototype, and finally, full-scale plants.

FAST BREEDER REACTOR

Chairman CANNON. I got the impression that you have practically decided that the fast breeder type offers the greatest possibilities.

Mr. STRAUSS. No, sir. However you received that impression, it was in error, sir. I hope it did not come from any testimony of mine, for I am completely open minded as to the optimum type.

Chairman CANNON. When do you expect to reach a conclusion as to which is the most practical?

Mr. STRAUSS. Mr. Chairman, we are at the early dawn of the era of atomic power. We cannot even begin to see our way.

But Dr. Libby has asked that he might have an opportunity to comment on this question. May I ask him to do so?

Dr. LIBBY. Mr. Chairman, the fast breeder has two points. You see, the other piles are burning up uranium 235 and making power.

But in the fast breeder you also make fissionable material. So there is a double purpose in the fast breeder to see whether you cannot only make power, but can make fissionable material at the same time.

Chairman CANNON. That means you can come out with more power than you put in?

Dr. LIBBY. And more material. The cost of the cheap, ordinary uranium or thorium which you burn up in the breeder can be disregarded as negligible. You get power and you get back more valuable material, more fissionable material, than you put in.

So it is an attempt, really to dispense with the diffusion plant, you see.

In the other installations you need the separated uranium. In this one you may eventually free yourself of this requirement.

So it is a very special type of reactor as compared with the others.

The breeder reactor is very important in our over-all program for this reason.

Chairman CANNON. It is quite possible, then, that eventually it will prove to be the type that you are looking for, but you cannot be certain of that until you have tried all types?

Dr. LIBBY. That is right.

It is also quite possible that, disregarding the cost of fissionable material it may be more economical than the others solely because it does produce fissionable material. That is my point. That is an important additional consideration of the breeder.

Chairman CANNON. Mr. Davis made a statement recently (June 13, 1956) in which he says:

> The fast breeder reactor has great potentials for low-cost power, not merely competitive power but really cheap power. The fast breeder reactor, therefore, justifies intensive work and development.

You agree with that?

Dr. LIBBY. Yes.

Chairman CANNON. Nothing you have said dissents from that statement?

Dr. LIBBY. It is a more difficult job, Mr. Cannon, than the other jobs, in my opinion. It is more exciting. The stakes are higher. I have every hope for it and I am most interested in this project.

I think we should do everything we can to support the breeder approach to see how far we can get with it.

Chairman CANNON. Now, in making these tests you are taking into consideration not only local conditions here in the continental United States, but conditions you find in other countries, or do you think the determination here in the United States ought to be final?

Dr. LIBBY. There are various considerations, Mr. Cannon. One, of course, is the cost of competitive power, coal, oil, water. But there is another one.

Chairman CANNON. By competitive power you mean competitive fuels?

Dr. LIBBY. Yes, power from fossil fuels and hydroelectric power.

But there is another consideration, and that is the fact that at the present time uranium 235 is available in appreciable quantities only from this country.

This is a factor, I think, in installing reactors abroad.

Mr. STRAUSS. Also, Mr. Chairman, two other considerations which will dictate the type of reactors which we will assist other countries to build will be safety and simplicity of operation.

In dealing, as we expect to deal, with underdeveloped countries where there is less scientific and engineering skill, our aim must be to put in the reactor of maximum safety and maximum simplicity.

REACTOR SIZES—NECESSARY TO DEVELOP BOTH LARGE AND SMALL

Chairman CANNON. We are interested in capacity from the very largest, perhaps five hundred thousand kilowatts, down to small sizes of then thousand kilowatts, or even less. It seems likely that three or four types may be needed to provide optimum performance in each size range.

I believe you told the Joint Committee earlier this year: That "reactors become more economic the larger they are; that is to say, the greater the output in kilowatts." and that small reactors might serve small cooperatives and small communities and for export.

Do you think after we have eventually reached the ultimate type it still may be necessary to build reactors in different sizes for different purposes?

Mr. STRAUSS. Yes, sir. There is no purpose in having a one hundred thousand kilowatt reactor in a community that can only use a couple thousand kilowatts of power.

For example, Mr. Chairman, to give you a concrete example, in my recent visit into the South Pacific I stopped at several Army and Naval installations which develop their own power. They develop power because there is no local——

Chairman CANNON. No use of atomic energy?

Mr. STRAUSS. Not at the moment, but we are developing power plants for them. One of them is the prototype which is being built down at Fort Belvoir, which we discussed here before you the other day.

These communities use as little as from 750 kilowatts up to 3,500 kilowatts in one instance. And it is for installations of that type that some of these smaller applications and smaller reactors will be of great use and we hope of great economic value to the country.

SAFETY AS A SUBSTANTIAL FACTOR

Chairman CANNON. Then we should have large reactors of all types and small reactors of all types.

You mentioned yesterday when you were discussing the various phases of this problem that safety was one factor entering into the problem. I believe you told us at remote locations there were expensive containment and safety features which might be less important out there than it would be in some more exposed positions. Just what would be the situation in that respect on these proposed reactors you are discussing?

Mr. STRAUSS. In military installations?

Chairman CANNON. Speaking generally of each type?

Mr. STRAUSS. I think, sir, until we know a great deal more about the hazards than we do now, that the members of the commission and the staff will live more comfortably with their consciences if we did not permit the erection of plants using our material as fuel unless we have approved designs, including adequate shielding against radiation hazards and the containment of the reactor itself.

LOCATION OF REACTORS—IMPORTANCE OF AVAILABILITY OF WASTE DISPOSAL FACILITIES

Chairman CANNON. And among other considerations, is it possible that one type of reactor might be more practical if located in a place where you would have facilities for the disposal of waste, but would not be the economic type located in some other place?

Mr. STRAUSS. You have raised another point, the disposition of waste, Mr. Chairman. That is not a serious problem at the present time in the location.

Chairman CANNON. So far as we are concerned the disposition of waste is not really an important consideration?

Mr. STRAUSS. Not at the present.

Chairman CANNON. But that is an economic question rather than safety question?

Mr. STRAUSS. Yes, sir.

FUEL COSTS AS A FACTOR

Chairman CANNON. As to the cost of fuel, different types use different fuels. Some reactors burn only enriched uranium. Some are efficient converters of one fuel to another, uranium to plutonium, for example. And others will produce more fuel than they use, as the breeder type.

The over-all nuclear fuel economy would be out of balance if all reactors were of one type or even two or three types. Is that a consideration?

Mr. STRAUSS. Yes, sir; that is a consideration.

I think, Mr. Chairman, that is a quotation from a speech by Mr. Davis that you were reading and it is of course from our best authority on the question. We respect his judgment on this very greatly as you have been able to discern from our testimony.

POWER DEMONSTRATION PROGRAM—ALLOCATION OF EACH OF THE FIVE BASIC CONCEPTS

Chairman CANNON. In providing for the erection and operation of these various types of reactors it is your policy apparently to limit the allocation of one type of reactor to one group?

Mr. STRAUSS. No, sir.

Chairman CANNON. I am speaking of the second program here, not the independent industrial program, but the power demonstration program, to which the government makes contribution. You have evidently adopted a plan under which you allocate to one group one reactor and then to another group another reactor, but no reactor is allocated to more than one group?

Mr. STRAUSS. No, sir.

If you will notice in Table II, Summary of Large Prototype Power Reactor Plants Proposed, and Summary of Small Prototype Power Reactor Plants Proposed, that there are four pressurized water, two boiling water.

I am going to ask Mr. Davis, who is more familiar with this subject than I am, if he will supplement my answer there.

Chairman CANNON. Admiral Strauss, when we consult the outline given us, this table of developing civilian atomic power (referring to Chart XI, printed above at page 97) in the second program, the power demonstration program, you have mentioned several of the pressurized water type, but actually under the schedule you have given us you have allocated that to the Yankee Atomic Electric Company and to no one else.

Mr. STRAUSS. But you are taking one little part of the program alone. This program is a program that must be considered in its entirety, sir.

The Yankee Atomic Electric Co. has the pressurized water reactor in the first round of the power demonstration reactor program, but

I want to make it very clear that they do not have the only pressurized water reactor being built or to be built in the United States.

Chairman CANNON. That is the only one they have under the power demonstration program.

Mr. STRAUSS. That is like someone saying the only one left is on a Tuesday.

Chairman CANNON. Under this industrial program they have as many as they want to apply for, but under the power demonstration program in which the Government cooperates and receives benefits back, you have only one.

Mr. STRAUSS. They came in and proposed that reactor to us. We did not allocate it to them.

An allocation presumes that we made the allocation. They made the choice of the type of reactor they wished built.

Chairman CANNON. You did not allocate it to anybody else under this program for which the Government pays for the experience developed in the course of the construction and operation of a reactor?

Mr. STRAUSS. I don't believe anybody else applied for such reactor.

Mr. DAVIS. No one else applied for such a reactor. We left it up to them which kind they proposed. We merely said we would not support several of the same identical type, because we were doing it for the purpose——

Chairman CANNON. Detroit Edison has been assigned what seems to be one of the most practical types of reactors.

Mr. DAVIS. They have elected to build one. They have not been assigned one. The have come in and said they wanted to build a fast breeder.

Chairman CANNON. They have been assigned government money under the demonstration power program and no one else has been assigned money under the power demonstration program.

And you are depending now on them alone. There is nobody else in prospect to build that type of reactor except the Detroit Edison people, isn't that true?

Mr. DAVIS. Well, we expect to be building one ourselves at Livermore.

Chairman CANNON. It will be all right to build it yourselves, but you do not expect to allocate funds to any other group.

Mr. DAVIS. No other group has applied to build a fast breeder reactor, sir.

Chairman CANNON. Is it your program to assign indefinitely to as many as make applications?

If a half dozen come in and make application, would you assign them all?

Mr. DAVIS. No, I don't think we would.

Chairman CANNON. That is the point. You have assigned to these people.

Mr. DAVIS. We want to demonstrate that power is feasible and economical, from this type of reactor. If two or maybe more came in for the purpose, we might be inclined to take them on, but not half a dozen; it is not necessary to have a half dozen conducted at government expense to make that demonstration effective.

Chairman CANNON. Is it necessary to have more than one?

Mr. DAVIS. It may not even be necessary to have more than one, But I cannot say that the Commission would not approve a second one if a second were proposed.

Chairman CANNON. Conducted simultaneously?

Mr. DAVIS. It might be. It is purely hypothetical since no second one has been proposed.

DETROIT EDISON—POWER REACTOR DEVELOPMENT COMPANY

Chairman CANNON. It looks now, Admiral Strauss, as if you would have to depend on some second one because while there is every evidence of your intention to allocate government money to the Detroit Edison Company——

(Discussion off the record.)

Mr. STRAUSS. This is a very interesting list of companies. It is The Power Reactor Development Company.

Chairman CANNON. Give us a list.

Mr. STRAUSS. It is a very interesting cross-section of American business.

Chairman CANNON. You may supply the list.

Mr. RABAUT. It is going to be at Monroe, Michigan.

Mr. STRAUSS. Monroe, Michigan, is the site that has been selected for that. Ground will be broken for the plant on August 8 of this year.

Mr. TABER. Why does Mr. Davis not read them?

Mr. DAVIS. This is from the testimony of Mr. Cisler to the Joint Committee, on May 24, 1956, page 191. The list of the membership companies of the Power Reactor Development Company and the Atomic Power Development Associates. The members of the Atomic Power Development Associates are as follows:

Alabama Power Co.
Atlantic City Electric Co.
Baltimore Gas & Electric Co.
Boston Edison Co.
Central Hudson Gas & Electric Corp.
Cincinnati Gas & Electric Co.
Cleveland Electric Illuminating Co.
Connecticut Light & Power Co.
Consolidated Edison Company of New York, Inc.
Consumers Power Co.
Detroit Edison Co.
General Public Utilities Corp.
Georgia Power Co.
Gulf Power Co.
Hartford Electric Light Co.
Indianapolis Power and Light Co.
Jersey Central Power and Light Co.
Long Island Lighting Co.
Metropolitan Edison Co.
Mississippi Power Co.
NEGEA Service Corp.
New England Power Co.
New Jersey Power & Light Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Pennsylvania Electric Corp.
Philadelphia Electric Co.
Potomac Electric & Power Co.
Public Service Electric & Gas Co.
Rochester Gas & Electric Corp.
Toledo Edison Co.
Wisconsin Electric Power Co.
Wisconsin Power & Light Co.

Allis-Chalmers Manufacturing Co.
Babcock and Wilcox Co.
Bendix Aviation Corp.
Commonwealth Associates, Inc.
Ford Motor Co.
General Motors Corp.
Jackson & Moreland, Inc.
Leeds & Northrup Co.
Pittsburgh Consolidation Coal Co.
Southern Services, Inc.
United Engineers and Constructors, Inc.
Vitro Corporation of America

The companies which have signified their intention of becoming members and making the necessary contributions to Power Reactor Development Company are some of the same ones:

Alabama Power Co.
Allis-Chalmers Manufacturing Co.

This first list was Atomic Power Development Associates. This is now the Power Reactor Development Company.

Mr. RABAUT. This is the company which will build this thing?

Mr. DAVIS. This is the one that will own it. Its constituent members are the Alabama Power Co., Allis-Chalmers Manufacturing Co., Babcock and Wilcox Co., Burroughs Corp., Central Hudson Gas & Electric Corp., Chrysler Corp., Cincinnati Gas & Electric Co., Columbus & Southern Ohio Electric Co., Combustion Engineering, Inc., Consumers Power Co., Delaware Power & Light Co., Detroit Edison Co., Fruehauf Trailer Co., Gulf Power Co., Holley Carburetor Co., Iowa-Illinois Gas & Electric Co., Long Island Lighting Co., Philadelphia Electric Co., Potomac Electric Power Co., Rochester Gas & Electric Corp., Southern Services, Inc., Toledo Edison Co., Westinghouse Electric Corp., and Wisconsin Electric Power Co.

Mr. PHILLIPS. From just a casual reading I think we have about twelve states involved in this.

Chairman CANNON. Yes, this is a cross-section of the country. It is such a combination of power and capital as has been seldom seen, which makes it evident that if they can obtain exclusive control of any fundamental rights or formulas, competition of any kind will be at a disadvantage it will never be able to overcome.

Mr. PHILLIPS. How does the Chairman come to that conclusion?

Chairman CANNON. And we have no assurance that they really propose to build this fast breeder reactor.

Mr. PHILLIPS. Who does not, Mr. Chairman.

Chairman CANNON. This group.

Mr. STRAUSS. What do you think they ask for from the Government, sir?

Mr. BOLAND. I do not quite follow you. I agree that this is a great combination, but it would seem to me this great group is interested in the fast breeder reactor. Is that not so?

Mr. STRAUSS. That is right.

Mr. BOLAND. There is governmental assistance in this program. There is no doubt that the government does know what is going on.

I would not think it would allow this great group of power companies to have a monopoly in this field because of all the technical know-how or whatever skill they have and the technical know-how they develop in building this reactor. Of course that is knowledge that your commission will have, is that not so?

Mr. STRAUSS. Every bit of it.

Chairman CANNON. The gentleman from Massachusetts is exactly right.

This group is acting as a unit. It is not operating as the component individual companies. It is proposing to request such special privileges as to render impracticable the construction which——

Mr. PHILLIPS. What special privileges?

Chairman CANNON. For example they are asking exemption from the Utility Holding Act, a matter involving legislation.

Mr. STRAUSS. How does that give them any monopoly of information?

Chairman CANNON. We are discussing how to get this type of reactor built, the fast breeder.

Mr. STRAUSS. That is right.

Chairman CANNON. And getting the benefit of the experience incident to building it and operating it. Here is a combination made up of numerous companies, representing various sections of the country applying for government largesse in return for which, as the gentleman from Massachusetts has indicated, the Government will be the possessor of all developments and discoveries they make.

They are proposing to build this reactor, one of the most promising of the types you propose to build. But they are asking special privileges. They are not willing to come in, as the program indicates here, and as others have been asking to come in. They are proposing first a complete exemption from the Utility Holding Company Act.

They are also asking exemption from the tax laws.

In other words, they are asking special privileges which we know cannot be granted or which, if they could be granted, would involve such delay as to postpone construction indefinitely.

Mr. STRAUSS. Do I think they should be permitted to deduct as part of their operating cost the amount they spend on research and development?

Chairman CANNON. That is a question for the Internal Revenue with due regard for the United States statutes to take up. I would not presume to pass on that.

Mr. STRAUSS. That is all they are asking for. They are only asking what is permitted to every citizen, as I understand it, that the expenses incurred in the conduct of your business are deductible income before taxes.

Chairman CANNON. If they are entitled to it, they would not have to ask it. All they would have to do is build the reactor.

Mr. STRAUSS. They are going to spend fifty-four million dollars of their own money and they want to be reasonably sure that they are going to get their fair share.

Chairman CANNON. Let us get their proposal. Let us see what they propose to do.

Mr. TABER. There is one question I would like to get out before that comes. I have been watching the names of the concerns that have been read off. At least ten of them—I may have counted wrong and got too few—are manufacturing and industrial corporations rather than electric power companies. This is not strictly an electric power company job. It involves industrial corporations in the nature almost of a cooperative.

Mr. RABAUT. I think that is a very fine situation.

Chairman CANNON. Of course.

Mr. RABAUT. That is why I asked for the list of names, because originally I heard of no power companies being in on it. Originally I heard of no other power companies being in on it. It was just simply a Detroit group.

As I remember, Dow was in it originally, and Chrysler and Ford. There were some others. I cannot remember who they all were.

But it was a big Detroit group, or a Michigan group, that was in on it. I was surprised when they read the others. I did not know they were in it at all.

DETROIT EDISON PROPOSAL—CONDITIONS PRECEDENT

Chairman CANNON. They are asking for special concessions. Here is the proposal they make:

"First, that neither the licensee corporation nor any member thereof or contributor thereto will become subject to the Public Utility Holding Company Act by reason of participation in this project."

And right there you have a stumbling block that will delay construction.

"Second, that the contributions of the members to the licensee corporation will qualify as deductible for federal income tax purpose."

Mr. PHILLIPS. Would they be individually?

Chairman CANNON. If so, why do they make that a condition?

Mr. STRAUSS. I think I can give you the answer in their own words, sir. These people are going to put up $54 million. Mr. Cisler in his testimony before the Joint Committee on Atomic Energy in May, stated:

"We stated and we assume and regard as essential that the contributions of the members of the licensee corporation will qualify as deductible for Federal income tax purposes.

"We have not sought a change in the law on this matter. Rather, we have requested an Internal Service Revenue ruling which will clarify and make certain the situation just as any prudent businessman would do."

Mr. PHILLIPS. I think they are entitled to it as individuals, but they have a problem when they get together.

What I do not understand is, are not all cooperatives and the TVA free from taxes? What is so unusual in this request if we are going to have these two groups in the same development.

(Discussion off the record.)

Chairman CANNON. This company has already requested the Public Service Commission to have $5 million to be spent on research and development of the proposed fast breeder reactor deductible for tax purposes.

The commission on March 23, 1955, granted such concessions.

In other words, it is not merely a federal matter. They must deal with each state individually.

Mr. STRAUSS. That is right.

Chairman CANNON. They are asking for a concession which is going to involve interminable delay.

Mr. STRAUSS. I think they have gotten action out of the states much more rapidly than out of the Federal Government.

Mr. PHILLIPS. What has the Consumers Power Company, for example, asked? Do they have this tax free arrangement already?

Chairman CANNON. Here is the proposition that Detroit Edison has asked for: They have made the application to the Atomic Energy Commission, imposing two conditions. You cannot physically and technically secure compliance with the two conditions in an appreciable length of time.

We are in a precarious situation. Russia, France, England, are now resorting to crash programs, especially Russia.

Now, it is up to us to keep our lead if we have not already lost it. And the only prospect we have for the development of this promising type of reactor is a proposition which will delay instead of accelerate the program.

Mr. STRAUSS. Mr. Chairman, I respectfully differ with you.

Mr. PHILLIPS. The gentleman from Missouri has taken the lead, and I think rightly, in trying to use all of the abilities and know-how and the facilities of the United States in an atomic program.

Now, is it not reasonable to say that we should also take advantage of all the brains, the know-how, the facilities, the efficiencies of all public, private, business utilities, everybody, and, therefore, it seems to me the gentleman from Missouri is in effect arguing against his own previous statement in what he says now, that we should not make it possible for a group like this, which certainly covers the entire field, to go into a new project in which we need the fastest possible development and which they can give.

We did not build these reactors and we did not make all these advances in atomic energy. We contracted out to du Pont or to Dow or to General Electric, or to somebody else to get their brains.

That is what we are talking about now. That is why I say to my friends, Mr. Rabaut and Mr. Evins, they know I will keep pounding at TVA until they pay taxes.

I see no different situation between this one and the one where the people could have an income tax exemption individually, saying "We want a ruling if we get together. We won't get tied up in government regulations that we know nothing about."

Mr. JAMES C. MURRAY. I notice here that in a continuing order it appears that the Michigan Public Service Commission will let them include their investment in this program in their rate structure, so they will actually get back from the Michigan consumers the investment they make in this program.

Mr. PHILLIPS. In research or in the whole program?

Mr. JAMES C. MURRAY. In research.

Are we going to let the Michigan consumers deduct their investment from their income tax?

Mr. PHILLIPS. I do not know, but you have organizations from a dozen states in that project, have you not?

Mr. STRAUSS. Every business consumer of power in Michigan is paying taxes on an income from which he has deducted his power charges as a part of his expense of doing business.

I would like to offer this observation, Mr. Chairman: I know you are very busy and your committee is very busy.

The Commission is not coming before you requesting any appropriation for the Power Reactor Development Company. We are not asking for any money from you at this time for this particular project.

Under the apprehension that you may have that there is such an item in our budget, I would like to assure you there is not in our current budget any item for this subject.

Chairman CANNON. The gentleman is far afield from the proposition immediately before us at this time.

Mr. STRAUSS. I am sorry.

Chairman CANNON. The gentleman from Illinois, Mr. Murray, outlines the situation exactly in this statement: that action on the part of the Michigan Public Service Commission applies to Detroit Edison only and not generally, as has been said here.

What is fundamental here? We need five large reactors and five small reactors.

One of the most promising of these is the breeder reactor. Our only prospect at this time of getting that breeder reactor built and into operation is through the Detroit Edison proposition.

They have not made an unconditional offer to accept contributions from the government through the Commission and begin at once, on immediate construction of this reactor. That is what we are striving for; that is what we must have.

We must have at the earliest possible moment at least five large reactors and five small reactors and the only proposal the Commission has brought in here is from Detroit Edison, and Detroit Edison says "We will not build it unless we are exempted from Federal statutes.

We will not build it unless we are exempted from taxes which otherwise we would have to pay".

Mr. STRAUSS. Suppose I told you the Commission was building one?

Chairman CANNON. I would say that was a consummation devoutly to be wished.

Mr. STRAUSS. Well, we are building one.

Mr. TABER. 17,500 kilowatts capacity.

Chairman CANNON. That is one of the smaller. The admiral emphasized the fact that we must have size and here is the statment of Mr. Davis that we must have size. We are not getting it.

Why are you not getting busy? Why aren't you building reactors?

If you cannot get anybody else to build them, why don't you build them yourselves?

Mr. STRAUSS. We are, and we are getting people to build them.

Chairman CANNON. You have not even made a proposition here to construct one of the large-size breeder reactors.

Mr. STRAUSS. We are getting private industry to build one for a hundred thousand kilowatts of generating capacity without any Federal funds going into that proposal, and $54 million of private money.

Chairman CANNON. That is not the case. $5 million Federal money is going into it.

Mr. STRAUSS. Not into the construction of the plant. It is going into research in connection with it.

Chairman CANNON. This thing you have to consider as a package?

Mr. STRAUSS. That money will be spent in our own laboratories, Mr. Chairman. It will be spent for the benefit of that type of reactor, whoever builds it.

AMERICA MUST HAVE REACTORS NOW

Chairman CANNON. This is a matter of national existence. It is a matter of great disappointment that you have not come here with a

program to maintain the lead, if you have a lead. You say you have a lead. But from all the evidence submitted, that appears to be doubtful.

Mr. STRAUSS. I disagree completely. I think this program does maintain the lead.

Chairman CANNON. You cannot maintain the lead without reactors and you are not building reactors. Outside of Shippingport you have nothing tangible, as the St. Louis Post Dispatch stated yesterday.

Mr. STRAUSS. That is not an authoritative article. I think you may disregard it on the basis of the fact it is made completely without authority by people in ignorance of the true information.

Chairman CANNON. There are other conditions. Altogether you are very carefully armored against the possibility of immediately building one of these reactors. Your companies are lending the impression to the country and trying to lend the impression to this committee that they are ready to go ahead, and they give no evidence of any intention of going ahead.

They have insulated themselves not only by these two conditions, and others which effectively strangle the program.

The proposal was to develop and approve a breeder reactor which would lead to the production of steam for the generation of electric energy and other production from nuclear fuels on a commercially competitive basis, subject to the granting by the Atomic Energy Commission of—

First, a license to locate, construct, own and operate a reactor to demonstrate its practical value, and

Second, a license to process special nuclear material, and

Third, a sufficient supply of fuel and blanket material, and

Fourth, the processing of irradiated fuel and blanket elements,

Fifth, a fixed and adequate price to be paid by the Atomic Energy Commission for special nuclear material produced by the fast breeder reactor, and

Sixth, the performance of certain research and development work in commission facilities.

We have to have the reactor and we have to have it now. But you can see they have no intention of building this reactor at any time in the determinable future.

Mr. STRAUSS. I do not see that at all, Mr. Chairman. They have already spent eight million dollars of their own money to date on this project.

I told you that they were breaking ground on August 8. I have been invited to attend the ceremony; I intend to do so.

I believe that they are businessmen whose word is good and men of good faith. I am sure you do.

URGENCY OF PROBLEM NOT MET BY DETROIT EDISON

Chairman CANNON. I am glad you have faith in them, but there is nothing to indicate any basis for that faith because they say here there are eight conditions which must be complied with before they build. And the conditions on which they insist will delay construction indefinitely if they can be met at all.

How can you comply? It is not within your power to comply with these conditions.

Mr. STRAUSS. I am satisfied there have been many circumstances in your own career where you have made conditions before you made financial commitments. You could not have achieved the success you have without exercising prudence. That is what these men are doing.

They are trustees of stockholders money. They are naturally going to act in a prudent manner.

I regard that as an evidence of the fact that we are dealing with intelligent, conservative men.

Chairman CANNON. We do not deny that at all. They may be a little too intelligent. The question before this committee and the country is: "Are you going to get five large and five small reactors and get them quickly?"

Mr. STRAUSS. We believe we are getting them as fast as we can.

Chairman CANNON. There is no evidence before the committee to that effect.

Mr. STRAUSS. No evidence except my statement and the photographs which we showed you yesterday, or the day before, sometime during the course of the hearing, of the work which has already been in progress.

Chairman CANNON. Mr. Taber, do you have a question?

Mr. TABER. What are the prospects of those conditions being met? What has to be done in order to meet them? They were read off so fast I could not follow them.

Chairman CANNON. The gentlemen will find them in the printed record.

Mr. TABER. I want to know what they are, one by one, and I want to find out about them as we get to them.

Chairman CANNON. The entire committee wants that information.

DETROIT EDISON CONDITIONS PRECEDENT ON FAST BREEDER REACTOR

Mr. TABER. Let us get it. That is what I am asking. They want first a license to locate, construct, own and operate a reactor to demonstrate its practical value.

Mr. DAVIS. They have an application for license before the Commission and the Commission is now considering it.

Mr. TABER. Is there a prospect that that might happen?

Mr. DAVIS. I think there is an excellent prospect that that will happen.

Mr. TABER. Then they want a license to possess special nuclear material.

Mr. DAVIS. There is every possibility they will get that license. That is tied in with the license for the construction.

Mr. TABER. Then they have, number one, a sufficient supply of fuel and blanket material?

Mr. DAVIS. That is what is granted them by the license for the fissionable material.

Mr. TABER. Two, the processing of irradiated fuel and blanket elements?

Mr. DAVIS. This is the subject of our contract negotiations with them for the assistance that we will give them.

As yet, the contract has not yet been signed.

Mr. TABER. Three, a fixed and adequate price to be paid by the Atomic Energy Commission for special nuclear material produced by the proposed breeder reactor?

Mr. DAVIS. The Commission has established fixed prices for the material, issued January 10, 1955.

Mr. TABER. Four, the performance of certain research and development work in Commission facilities?

Mr. DAVIS. This is the subject of our contract negotiations and we have agreed to this in principle.

Mr. TABER. The proposal contains the following conditions:

One, that neither the licensee, corporation, nor any member of or contributor thereto will become subject to the Public Utility Holding Company Act by reason of participation in this project.

Mr. DAVIS. That is outside the jurisdiction of the Atomic Energy Commission, but we know that they have made applications for such exemption.

(NOTE. The Chairman of the Securities and Exchange Commission, having jurisdiction of the subject, testified before this committee that no such application has been filed, notwithstanding the fact that Detroit Edison had a bill introduced in Congress in July 1955 for an exemption from the jurisdiction of SEC.)

Mr. TABER. They have made application to the SEC?

Mr. DAVIS. That is correct.

Mr. TABER. Two, that contributions of members to the licensee corporation will qualify as deductible for Federal income tax purposes.

Mr. DAVIS. They have made application to the Internal Revenue Service for such a ruling.

Mr. TABER. The proposal emphasizes the necessity that the licensee be reasonably sure of its ability to obtain adequate public liability insurance. We have talked about that quite considerably here.

Mr. DAVIS. Yes.

Mr. TABER. Now, when did these people begin to negotiate with you for this particular setup?

Mr. DAVIS. Their proposal was received on April 1, 1955. The Commission approved the negotiation of the contract with them sometime later in the summer and we have been working out the details of the contract with them since.

Mr. RABAUT. They certainly were active on this long before April 1, 1955, with the Commission? They might have asked for a license whatever it was at that time, but they certainly had activity long before that.

Mr. DAVIS. They had a research and development program on the fast breeder reactor. They have been working on the fast breeder, I believe, since about 1952 or 1953.

I personally had discussions with them in the summer of 1953 and know that they were fairly well advanced on their thinking on a fast breeder at that time.

Mr. RABAUT. But they incorporated, I am told, in March 1955, and then they made the application in April?

Mr. DAVIS. They originally did this under a study agreement with the Commission. Since they formed the Atomic Power Development Associates, Inc., and they have spent about nine million dollars.

I do not know how much they spent previous to that in their study group, but it was a substantial sum of money, including not

only studies, but also actually research and development work which they paid for with their own money with no contribution from the Government whatsoever.

Mr. RABAUT. What is your normal expectancy of continued delay? Are there many steps still necessary for these people to take before they really can get into this program. Is it enough to say break ground? But to get these permissions——

Mr. STRAUSS. I think you are in a better position to answer than we are as to how long Congress will take.

Mr. RABAUT. Congress is only part of it. You have some State matters which are involved.

Mr. STRAUSS. The principal ones were mentioned here.

Mr. RABAUT. I know those are the principal ones, but there are others which could have you in a jam.

Mr. STRAUSS. I would think if the liability matter and public utility holding company matter were resolved, that they would not hesitate to make substantial additions to their already substantial expenditures in the confident belief that these minor matters would be resolved favorably. They are making orders now for equipment, Mr. Davis tells me.

These people believe that all of us here in Washington, on your side of the table and ours, are disposed to be helpful and encouraging in this, and I think we all are when the chips are down, and I believe they will go ahead with this and they will never know that these temporary differences of opinion have developed and have been ironed out, or debated at any rate, across the table.

Mr. TABER. Now, you say that they have arranged to break ground for construction the 8th of August?

Mr. STRAUSS. That is the information contained in an invitation I have received from the company.

Mr. TABER. Have you had any intimation that these people were not going to go ahead and proceed with the job?

Mr. STRAUSS. No, sir; I think, as I said before, Mr. Taber, they are absolutely confident that we will do the proper and logical thing and that they will be breaking ground with a large number of these hurdles overcome.

FAST BREEDER REACTOR

Mr. TABER. These two power propositions are the only ones, the one at the Argonne National Laboratory and the one at Monroe, Michigan, are the only two that you are in the process of working out on this so-called fast type.

Mr. STRAUSS. Fast breeder.

Mr. TABER. On the other hand, are those not the same things that are in some of these things like the *Nautilus*?

Mr. STRAUSS. No, sir; this is the type of reactor which we described during the early hours of the hearings on Monday, I think it was, a reactor, Mr. Taber, which because of its blanket of fertile material, thorium, is able to produce—it is hoped and believed—more fissionable material than it consumes.

So that there will be a net gain to us.

Mr. TABER. After developing the power from the fuel?

Mr. STRAUSS. That is right, sir.

Mr. TABER. Now, is that regarded by you as among the best possibilities?

Mr. STRAUSS. As a very promising possibility. The development of which we must push.

SODIUM GRAPHITE REACTOR, NEBRASKA

Mr. TABER. Now, in the sodium cooled reactor you seem to have the Consumer Public Power District in which you are putting up ten million dollars, and they sixteen million dollars—

Mr. TABER. And the one in Santa Susana, California. And AEC and South California Edison seem to be in that one.

Mr. STRAUSS. That is right.

Mr. TABER. That is a small one?

Mr. STRAUSS. It is the prototype of the Consumers Public Power project.

SHIPPINGPORT PRESSURIZED WATER REACTOR

Mr. TABER. We have heard considerable about the Duquesne Power. I won't go into that. That is one of your jobs with the Westinghouse?

Mr. STRAUSS. Yes.

Mr. Taber, because there has been some apprehension on that, may I say the entire site, the whole generating half of the plant is being built by private capital, that private capital is contributing five million dollars to the Government side of the plant and paying the operating expenses of the Government side. And paying eight mills for the power which is about three mills more than they can produce it for themselves.

Mr. TABER. That is pretty nearly ready to go?

Mr. STRAUSS. That will be in operation within the first six months of 1957.

RUN DOWN OF PRESENT PROGRAM

Mr. TABER. You have the Yankee Atomic Electric setup.

There the largest part of the job is private. That is pressurized water the same as the Duquesne one.

Mr. STRAUSS. Yes, sir; with some improvements and larger.

Mr. TABER. The University of Florida has a small job there.

Mr. STRAUSS. Yes, and that is in its very early conversation stages. Early negotiations.

Mr. TABER. You have another one at Indian Point, Consolidated Edison of New York.

Mr. STRAUSS. That is a project, Mr. Taber, in which the Government has not a penny invested and will not have. That is a project which is expected to produce 250 thousand kilowatts of electrical energy which amount includes 110 thousand kilowatts produced by conventional means and its completion is anticipated within four years.

Mr. TABER. What is the status of that?

Mr. DAVIS. The status of that is that they are proceeding with the detailed design and that contractor, Babcock and Wilcox, has constructed a new plant for fabrication of fuel elements for this reactor.

In addition to that they have constructed a critical facility where they are now engaged in testing out the physics of the reactor core preparatory to starting the actual manufacture of the fuel elements.

They have already spent several million dollars on construction of facilities and on preliminary work.

Mr. TABER. Have they made a contract with you of any kind?

Mr. DAVIS. Since they are an independent company, they have applied to us for a license for the construction of this reactor and they have been granted such a license for its construction.

They have also been allocated the fissionable material that is required over the life of the license, which they will pay for.

Mr. EVINS. The gentleman asked him why the Duquesne Power and Light Company would voluntarily acquiesce in paying a higher rate for power than they can produce it for themselves. Is it because they want to fatten up their expense accounts?

Mr. STRAUSS. I am sure you do not intend me to answer that question either yes or no.

In the first place, I did not participate in the deliberation of the Duquesne Company to undertake this enterprise. It was undertaken before the Atomic Energy Act of 1954 was enacted. It was a pioneer enterprise.

These are patriotic American citizens who own it and comprise its directorate, and to imply that they want to fatten up their expense accounts—I am sure you mean it jocularly and I will answer it in the same vein,—

HOLYOKE—GAS COOLED REACTOR

Mr. BOLAND. I do not find in your justifications any amount requested for the gas cooled reactor program. Are you requesting any money for that?

Mr. STRAUSS. If Mr. Davis will describe the item that we have in our budget request having to do with gas cooled reactor development.

Mr. DAVIS. We have an item in the budget under the heading of the Army power reactor program for study and development work on a closed cycle gas turbine reactor, with the expectation that that effort will be pursued to the point of building a reactor experiment.

This project is being carried under the Army program although it is actually a joint project between our civilian reactor power branch and Army power reactor power branch because of the possible applications of this concept to mobile military requirements.

Mr. BOLAND. So this experiment is done under the Army program. It is not under the programs you have listed here?

Mr. DAVIS. This is a preliminary step. We do not today have the technology to move ahead. This project is to get the basic information with which someone could go ahead with such a reactor.

One of the proposals that we have, if you will note down here on the sheet, is a gas cooled reactor for the City of Holyoke, Massachusetts, which has proposed a reactor under the power demonstration program. It is a gas cooled, closed cycle reactor which would be built by the Ford Instrument Company.

Mr. BOLAND. And as far as the request is concerned, this is a public power company; they have made application, have they, to the Atomic Energy Commission to receive a license for this type of reactor?

Mr. DAVIS. No, they have not applied for a license. They have applied for assistance under the second round of the power demonstration reactor program.

Mr. BOLAND. Do you have any idea what the cost of this reactor will be?

Mr. DAVIS. They have indicated that the cost of the reactor would be about 2.4 million dollars.

Mr. BOLAND. I see that the total cost will be $10,128,000, of which the City of Holyoke will pay $4,028,000, and the Government will put up $6,100,000 for the technology to be learned.

Can you estimate the time between now and when the ground breaking might take place for this particular one?

Mr. DAVIS. No, sir; I cannot.

Mr. BOLAND. This would be a few years into the future?

Mr. DAVIS. They have indicated they would hope to have such a project completed by 1961, but the difficulty is that we don't have the technical information at the present time which will tell you how soon you can go ahead on such a project.

Mr. RABAUT. How much did you say that was going to cost?

Mr. DAVIS. $2,400,000 for the reactor portion of the plant. The City of Holyoke would provide the cost of the turbine generator.

Mr. RABAUT. How much would the balance of the cost be?

Mr. DAVIS. The balance of the cost would be four million dollars.

Mr. RABAUT. The whole thing is about six million dollars?

Mr. DAVIS. The total cost of construction is estimated at 6.4 million dollars and there is an additional cost of research and development which has been proposed at 3.7 million dollars, which would make the total cost ten million dollars, and the cost to the Atomic Energy Commission 6.1 million dollars.

Mr. BOLAND. The cost to the power company is 4 million dollars apparently.

Now, one of the things that has been bothering me in relation to this type of program, insofar as the smaller cooperatives are concerned and smaller public power companies—I am wondering whether or not you are moving ahead too fast on some of these reactors—because here is a city that is going to spend some four million dollars of its funds for the purpose of building a reactor about which we have not too much knowledge apparently, and yet it might very well be that the fast breeder reactor will apparently lend itself to being the most economical in the long run and probably the best type of reactor, from what I gathered this morning.

It would seem to me this might very well be a waste of money.

Mr. STRAUSS. It is inevitable, sir, that people who buy the prototypes find themselves with obsolete equipment.

But somebody has to take a chance. I am not at all sure that when they come up with this we will recommend it.

Mr. BOLAND. You are not at all sure this is the most feasible and the most economical?

Mr. STRAUSS. Not at all sure. We may even when they come to the Commission say to them, "This is not the thing we think you should build."

If they want to go ahead and build it, we will help them build it, we think.

Mr. BOLAND. But you are not going to tell them to go ahead and build it if there is another reactor which will serve the same purpose at a more economical figure to the people who pay the cost?

Mr. STRAUSS. That would not be a proper discharge of our duties.

Mr. BOLAND. I can understand how there is a great need for progressing with this thing as rapidly as possible, but I can also see the great danger of applicants coming in, the licensees coming in and getting licenses and going ahead and building reactors which may be out of date within a matter of a year or two years after operation.

Mr. STRAUSS. That is right.

Mr. DAVIS. One point with respect to the fast breeder is that we don't think this is the kind of reactor which will be applicable in small sizes.

On the other hand, a gas-cooled, closed-cycle reactor looks as though it is attractive for the size they are thinking about.

This illustrates the point that there are several kinds of reactors for different sizes.

Mr. BOLAND. As of this moment, you do not think the fast breeder will be applicable to this particular operation?

Mr. DAVIS. No, sir.

Mr. JAMES C. MURRAY. In the event, as Mr. Boland indicated, that the reactor that a certain company placed in a generating plant was not the best type, and you approved another type, has there been any study on the problem of converting or changing?

Mr. STRAUSS. It is a generating plant as well.

That is a technical problem which I am going to ask Mr. Davis to answer for you.

There are undoubtedly some plants where the reactor part might be interchangeable. There are others which require, as you may have noticed from those charts which were photographed and passed around the first day, a second cooling system, a second boiler, which might make it extremely difficult.

But Mr. Davis, would you discuss the technical difficulties and possibilities in connection with the answer to that question?

Mr. DAVIS. In this particular case, what they are proposing is a reactor which does not use the steam cycle for the generation of power. They are going to heat nitrogen in the reactor and pass this to a gas turbine.

The reactor itself would under this proposal be owned by the Commission.

So if this should not work out, one would then have the problem of putting some other kind of gas generator in and continuing to operate the turbine section of the plant.

This may be feasible. I don't know how easily it could be done. But in any case, I think it is possible.

I cannot comment as to whether it is economical.

CONVERSION FROM AN OBSOLETE ATOMIC PLANT CONCEPT BACK TO CONVENTIONAL

Mr. JAMES C. MURRAY. The companies that are contemplating reactor plants, assuming they find that the reactor type of operation is not feasible, and they want to convert to a coal operation, have there been any studies as to the cost of that change, or is that feasible?

Mr. DAVIS. In most cases I think it would be feasible. The cost sometimes might be rather high. This would depend on the type of reactor you have.

If it is a low temperature, low pressure steam reactor, then the turbine is really what amounts to the second half of the turbine you would have in a conventional plant.

One could then install a boiler and perhaps high temperature turbine, take the steam from the high temperature conditions down to those you already have in the lower section of the plant.

I think in most cases it would be possible to do this. I cannot comment on the cost because that would depend so very much on the exact circumstances you would have with each reactor.

Mr. JAMES C. MURRAY. Do you think that any of these companies that have indicated a desire to participate in this program are contemplating that if the reactor does not work out they will be able to convert the plant into a steam, conventional power generating plant, or do you think that has entered their minds at all?

Mr. DAVIS. I know it has entered the mind of some of them.

Mr. JAMES C. MURRAY. In determining the risk they are taking, would not that be an element to consider, that if the reactor does not work out they can always return to steam operation?

Mr. DAVIS. As I said, I believe this is a consideration in the mind of at least some of them. I know I have participated in discussions where they have mentioned this.

RUN-DOWN OF REACTOR DEVELOPMENT PROGRAM

Mr. TABER. Now, I thought I would like to go down through these projects and see if we could not get a statement as to the status of each one of them.

Now, this Yankee deal, Yankee Atomic Electric setup for 134 thousand kilowatts at Rowe, Massachusetts, what is the status of that?

Mr. DAVIS. We have signed a contract with them to go ahead with this project. They have not yet been issued a license. I am not sure that they have applied for one so far.

Mr. TABER. You mean from you?

Mr. DAVIS. From us. We have signed a contract with them which does set forth the conditions under which we will assist them.

Mr. TABER. When was that contract entered into?

Mr. DAVIS. About three weeks ago.

Mr. TABER. You expect them to begin to work on that pretty quick?

Mr. DAVIS. I am sorry, it was June 6, 1956.

Mr. TABER. We are a little bit by that, are we not, about 3 weeks.

The University of Florida, that is going on, is it?

Mr. DAVIS. The University of Florida proposal is still under consideration.

Mr. TABER. That is a pretty small one, anyway.

Mr. DAVIS. That is a very small reactor, actually below the sizes——

Mr. TABER. The Lemont, Illinois, that is entirely a boiling water job and that is in process?

Mr. DAVIS. That is entirely a Commission job as a part of our power reactor development program.

Mr. Strauss showed you yesterday a picture of the progress of that. It should be in operation in 1957.

Mr. TABER. The Elk River is a farmer's cooperative setup, twenty-two thousand kilowatts. What is the status of that?

Mr. DAVIS. The Commission has approved the negotiation of a contract with them. We are exchanging draft contracts. We have every reason to believe that will go ahead.

Mr. TABER. Within what time?

Mr. DAVIS. It is scheduled for completion in 1960.

Mr. TABER. But within what time would the contract be completed?

Mr. DAVIS. I would hope within the next month or two.

Mr. TABER. The next one is Dresden, Commonwealth Edison Company and others, 180 thousand kilowatts and the boiling water deal.

Mr. DAVIS. That is a boiling water reactor.

Mr. TABER. What is the status of that?

Mr. DAVIS. That is an application for a license and again a construction permit has been issued for that and an allocation has been made of the material.

The General Electric Company is building a test reactor at Livermore, California, or near Livermore, which is to test the fuel elements and to test out their cycle, which I might point out, is somehwat different from the boiling cycle used at Illinois or by the Elk River people in Minnesota.

Mr. TABER. The Santa Susana project is in progress.

Mr. DAVIS. That is under construction. We hope that will be finished by October and that the plant will be in operation very early next year.

Mr. TABER. Does that Dresden job provide for any benefits to come to the government, or to the Commission?

Mr. DAVIS. Since it is completely an independent job, they are not required to provide us with the information, although it is my understanding that they will in fact provide us with information.

I would like to point out at this time that so far these people who are proposing these independent reactors programs have published a wide variety of technical articles in the technical journals and at technical meetings on the details of their design, which is what they are working on at the present time, and we have every indication they expect to continue to do so.

At the power conference in Geneva last year there was a large number of articles published over there.

Mr. TABER. The one in Anchorage, that is practically a Government job anyway, is it not?

Mr. DAVIS. That is one where the Commission will pay for the cost of reactor and will pay a considerable amount of research and development cost.

Here, again, as in the case of the Holyoke gas cooled reactor, they are proposing an unusual type of reactor which seems as though it might well be adapted to small plants.

Mr. TABER. What is the status of that?

Mr. DAVIS. The status is that it is still being considered by the staff of the Commission as a proposal. We are not negotiating a contract with them.

Mr. TABER. When do you expect such a thing might happen?

Mr. DAVIS. I would hope that we would have some recommendations to make to the Commission within the next few weeks.

Mr. TABER. The fast breeder job, the one at the Argonne National Laboratory, for 17,500 kilowatts, what is the status of that one?

Mr. DAVIS. The status of that is that at the present time we are seeking an architect-engineer to commence the detailed design work on that reactor. There have been a large number of tests including a full-scale non-nuclear mockup to test out the operation of the sodium system.

We now feel we are prepared to go ahead with the detailed design, construction, and operation.

Mr. TABER. You expect that is going to move right along?

Mr. DAVIS. Yes, sir.

Mr. TABER. The Los Alamos job, that is also a Government job, but no electricity on that?

Mr. DAVIS. They are working on quite an unusual type of fast breeder there where the fuel material and the core would actually be a molten mixture of plutonium and other metals.

Mr. TABER. Rather than what?

Mr. DAVIS. This would be rather than using a solid metallic fuel element.

Mr. TABER. Monroe, Michigan, we have talked a lot about.

The Oak Ridge National Laboratory, that is going along, is it?

Mr. DAVIS. The construction of the homogeneous reactor experiment at Oak Ridge has been completed. They are now beginning the preoperational testing of this plant.

It is our expectation that such testing will be completed in the next two months and that the reactor will be in operation sometime this year.

Mr. TABER. The Los Alamos job?

Mr. DAVIS. In this case they are working on an advanced concept of the aqueous homogeneous reactor. They have one experiment on which construction is essentially completed and another one for which they have all the components but have not yet finished the actual construction.

Mr. TABER. The Michigan Wolverine Electric Cooperative, ten thousand kilowatts?

Mr. DAVIS. The Commission has authorized the negotiation of a contract with them. We again are at the stage of exchanging draft contracts with them and see no reason why this negotiation will not go ahead very expeditiously.

Mr. TABER. The total cost is what?

Mr. DAVIS. The total cost is $4,876,000, of which the Government would contribute $3,788,000.

Mr. TABER. Pennsylvania Power and Light Company, 150 thousand kilowatts. What is the status of that?

Mr. DAVIS. The status of that is that they are working, doing a very considerable amount of development work of their own in combination with the Westinghouse Electric Corporation and the Union Carbide Nuclear Corporation.

They plan to spend many millions of dollars. I have forgotten the total. They are presently engaged in the development program costing several million dollars per year.

They plan to start the actual design and construction of this plant in 1958.

The reason for this apparent delay is that they are working towards an advanced concept which they hope will achieve very nearly, if not actually, competitive nuclear power.

Mr. TABER. That liquid metal setup is Babcock and Wilcox?

Mr. DAVIS. Yes, we are at the present time negotiating a contract with Babcock and Wilcox Company to design, construct and operate a liquid metal fuel reactor experiment which will be the first reactor which will utilize the liquid metal fuel concept.

Mr. TABER. When do you expect to have that?

Mr. DAVIS. We would hope to have that in perhaps 1958 or 1959.

Mr. TABER. The City of Orlando, Florida, twenty-five thousand to forty thousand kilowatts capacity. What about that?

Mr. DAVIS. They have proposed the construction of a reactor which will be based on the liquid metal fuel reactor experiment. The proposal is being studied by the staff of the Commission and no recommendation has been made on it so far.

Mr. TABER. That, you expect, will cost what?

Mr. DAVIS. The estimated cost of that total project is 30 million dollars, the Commission being asked to contribute 19 million dollars, Orlando contributing 11 million dollars.

Mr. TABER. You have an organic moderator setup. You have a contract with North American Aviation for that?

Mr. DAVIS. Yes. They are right now engaged in the design and procurement of parts for this reactor experiment and hope to have it in operation very early next year.

Mr. TABER. That is a Government job entirely?

Mr. DAVIS. That is a Government job.

The reactor itself is located at Arco, Idaho.

Mr. TABER. The City of Piqua, Ohio, 12, 500 kilowatts set up there, what is the cost of that?

Mr. DAVIS. The estimated total cost of this project is $7,300,000, of which Piqua will supply roughly two million dollars for the conventional portion of the plant, the Commission being asked to contribute $5,300,000, of which 3.3 million dollars will be for the construction, 2.0 million dollars for research and development.

Mr. TABER. What is the status of that?

Mr. DAVIS. The Piqua proposal is still under consideration.

Mr. TABER. You have an unspecified item in here, Florida Power Corporation, Florida Power and Light, and Tampa Electric for a couple hundred thousand kilowatts. What is the status of that?

Mr. DAVIS. The status of that is that they have been conducting studies and that they have retained a couple of contractors to make some detailed studies and analyses of various types of reactors before they proceed with the actual design and construction. They have not yet selected what type it might be.

Mr. TABER. Now, as to the future program of the Commission, are there in prospect other construction items that you would expect would materialize and that the Commission desires to move on?

Mr. DAVIS. Are you thinking of reactor experiments or large-scale reactors?

Mr. TABER. Large-scale reactors and large-scale construction. I presume there will be quite a lot of small ones. I can see why, for instance, eight mills a kilowatt might be a high price for electricity in a place where coal was plentiful and close to the power plant.

On the other hand, it might not be a high price for electricity at a point where there was a very considerable transportation cost for the fuel and that sort of thing.

I can see that. Sometimes these small setups would be useful in certain spots even if they did run to eight mills.

On the other hand, they might not be any good at all for a place that had readily available coal to produce the electricity.

Now, what is the Commission's idea on what ought to be done? And where you would go from the list that we have just been over?

Foreign Countries' Interest in Reactors

Mr. Davis. I think I might also mention that there are a considerable number of plans at the present time for American built foreign reactors which were not included on this list, but which would provide much the same opportunity for development of technology as the reactors which are built in the United States.

Mr. Taber. You mean we would farm out to other countries reactors and that power plant——

Mr. Strauss. Let me give you a concrete example.

The Belgians, the Belgian industry, acting under a bilateral agreement which has already come into existence between the United States Government and the Belgian Government, propose to construct a reactor in Belgium near the City of Brussels, and placed an order with Westinghouse Electric Corporation for such a reactor.

That will be a reactor of the general Shippingport pressurized water reactor type, and there will undoubtedly be other countries abroad which will buy reactors from the United States, among other reasons because we are the only country, up until now at any rate, which has announced a policy of making atomic fuel available for such reactors, and likewise because, in my own personal belief, we are the only country with a reactor design specifically dedicated to power production, rather than to production of weapons materials with power as a byproduct.

Mr. Davis. I might point out that the American Foreign Power Company have asked for and received bids from six American companies on their power reactors and are negotiating contracts with two of them and expect to negotiate a contract with a third very shortly.

These are three power reactors abroad which will go to Latin America.

Mr. Strauss mentioned the Belgian power reactor. We know that bids are being worked on by a number of American manufacturers for large reactors in the size range of fifty to one hundred thousand electrical kilowatts for such places as the Philippines Islands, Italy, Japan, and the Federal German Republic.

There was an announcement the other day of the signing of a contract between the Glenn L. Martin Company and Dominican Republic for the construction there of a power reactor.

There are others that are in the wind, too. These are all things that we know definitely are under the most serious consideration.

Mr. Strauss. None of those requires Government assistance.

Mr. Rabaut. Knowing the stability of the Belgian people over there, what size reactor is that?

Mr. DAVIS. That is in the neighborhood of eleven thousand five hundred kilowatts. It is a small one. They have not yet settled on a site at which it is to be located.

Mr. RABAUT. Was the fast breeder reactor at all suggested to them?

Mr. STRAUSS. We didn't make any suggestion to them.

Mr. RABAUT. Was it far enough developed for them to consider it at the time?

Mr. STRAUSS. I don't think so.

(Discussion off the record:)

Mr. EVINS. How many of these reactors to be built in foreign countries is the United States participating in? You mentioned the Belgian one and you mentioned others under consideration. How many is the United States participating in?

Mr. STRAUSS. Mr. Davis.

Mr. DAVIS. The United States would not be participating in any of those that I mentioned in the way of funds, but the American manufacturers will be building these reactors under fixed price contracts for these foreign companies and governments.

Mr. RABAUT. How many do you have bilateral agreements with?

Mr. STRAUSS. Some forty-two countries as a whole. They are not all power agreements. There are some eight of those.

Chairman CANNON. Are any of these being paid for out of money contributed to foreign aid?

Mr. STRAUSS. The Manila reactor, when and if it is constructed, will come out of the ICA appropriation somewhere and, of course, the research reactor program to the assistance of which the Government has pledged a maximum of 350 thousand dollars per reactor, would come out of the mutual assistance funds, but to date the total demand on that fund is of the order of, I think, 1,400,000 dollars. That is a rough figure that is in my mind.

Mr. EVINS. Am I correct in surmising you have bilateral agreements with forty nations?

Mr. STRAUSS. One was signed this morning and two the evening before. The number of agreements which have become fully effective or for which negotiations have been completed is 38.

Mr. EVINS. You have provided full libraries of atomic information to some thirty nations; is that correct?

Mr. STRAUSS. The number is now greater than forty.

Mr. EVINS. Would you state now how much United States funds will go into the assistance and construction of atomic reactors, either through the use of counterpart funds, or appropriated funds in the foreign aid programs?

Mr. STRAUSS. If you will divide your question, Mr. Evins, between research reactors and power reactors, I would say that as far as research reactors are concerned we have the possibility of being called upon by each of the nations represented by the forty-odd agreements that I have indicated for assistance—

Mr. EVINS. You have every possibility of being called upon. We understand that. You may have possibilities of more requests for information and assistance of this you may be assured.

I would like to know to how many nations under these agreements have we committed ourselves for any funds, either in counterpart funds or foreign aid funds.

Mr. STRAUSS. We are committed as the result of the execution of the bilateral agreements and the President's offer, which was approved by the Joint Committee before it was made, to assist each of the forty-odd nations with which we have bilateral agreements for research purposes, to help them construct a reactor to the extent of a contribution of 350 thousand dollars provided——

Mr. TABER. You mean as to each?

Mr. STRAUSS. As to each—provided we have approved all of the details of the design, its location, their competence to operate it, and their general, what shall I say, fitness to have it and possess it.

With respect to power reactors we have a very much smaller number of bilateral agreements outstanding and we have no commitments to provide funds to any country for that purpose.

AMERICAN MONEY IS MISAPPLIED

Mr. EVINS. Committee counsel has provided some information here that on June 20th of this year officials of the Atomic Energy Commission testified before this committee on ICA, the subcommittee on ICA appropriations, in support of the request for $5,950,000 to finance the export of research reactors to foreign nations, that each reactor is estimated to cost seven hundred thousand dollars, half the cost of which is to be borne by the United States and half to be borne by foreign countries.

Under bilateral agreements with foreign nations, seventeen such research reactors have been definitely committed, and it is expected that an additional twelve reactors will be committed in the near future.

Mr. STRAUSS. That is the details of the testimony I have just given you.

Mr. EVINS. In other words, you testified earlier there had been none as I understood it.

Mr. STRAUSS. No, sir; I said there has not been commitments for any power reactors. When you began your question I said I would have to divide my answer as between research reactors and power reactors.

Mr. EVINS. You did testify that we are committed to some forty nations in this field.

Mr. STRAUSS. For research reactors. Those are the ones you just read.

Mr. EVINS. Leaving aside for the moment research reactors, how many nations are we committed to for power reactor developments?

Mr. STRAUSS. None, sir.

Mr. TABER. There is Belgium.

Mr. STRAUSS. Not one penny.

Mr. TABER. I know we are not paying for it, but we have arranged for them to contract for it with the manufacturer?

Mr. STRAUSS. Yes, sir. I understood the question of Congressman Evins to be a question as to what countries we had commitments to give financial assistance to for the erection of power reactors. At the present time we have no commitments to any country.

Mr. EVINS. There are no limitations, provisions, or restrictions with respect to purchases to be made from American companies, even though American funds are provided and information and assistance is furnished.

In other words, even though American funds were being provided, the foreign nations are not required to buy the reactors from American countries?

Mr. STRAUSS. That is right.

Mr. EVINS. But they are free under terms of our agreements to buy them from Britain, Russia, or any other country?

Mr. STRAUSS. That is right. We have to approve the design before we make the fuel material available.

Mr. EVINS. In other words, we provide them the information and we provide them the appropriations through foreign aid and otherwise, and yet there is no binding contract that they must buy them from American industry?

Mr. STRAUSS. The information is in the public domain, sir. There is nothing on research reactors that is classified.

Mr. EVINS. Furthermore, if they develop something, they can sell it back to the United States.

Mr. STRAUSS. No, sir. The agreements provide for an exchange of information.

Mr. EVINS. Mr. Strauss, and I assure you that I am serious in this matter, one of the things that has given me considerable concern throughout these hearings is the fact that we are developing vital information, both with Government research to a limited extent and greatly in cooperation with industry, which we applaud, but after we have developed this information we have agreements with some forty nations to turn it all over to them.

In addition we supply many foreign nations with libraries of atomic information and we, in turn, have no binding agreements that the United States will benefit from such an arrangement.

Mr. STRAUSS. Mr. Evins, I suggest you read the agreement before you criticize it.

Mr. EVINS. I say that is a matter that has given me a great deal of concern.

Mr. STRAUSS. I think your concern will be relieved if you will take the trouble to read a text of an agreement and I will see that a copy of a typical bilateral research agreement is put in the mails to you as soon as this meeting is adjourned.

Mr. TABER. How much is there to it?

Mr. STRAUSS. A half dozen pages.

Mr. TABER. I think we ought to have a copy for the use of the committee.

Mr. STRAUSS. May I submit one.

Chairman CANNON. If you will.

(The material referred to is as follows:)

AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF ——— CONCERNING CIVIL USES OF ATOMIC ENERGY

Whereas the peaceful uses of atomic energy hold great promise for all mankind; and

Whereas the Government of the United States of America and the Government of ——— desire to cooperate with each other in the development of such peaceful uses of atomic energy; and

Whereas the design and development of several types of research reactors are well advanced; and

Whereas research reactors are useful in the production of research quantities of radioisotopes, in medical therapy and in numerous other research activities and

at the same time are a means of affording valuable training and experience in nuclear science and engineering useful in the development of other peaceful uses of atomic energy including civilian nuclear power; and

Whereas the Government of ——— desires to pursue a research and development program looking toward the realization of the peaceful and humanitarian uses of atomic energy and desires to obtain assistance from the Government of the United States of America and United States industry with respect to this program; and

Whereas the Government of the United States of America, acting through the United States Atomic Energy Commission, desires to assist the Government of ——— in such a program;

The Parties agree as follows:

ARTICLE I

For the purposes of this Agreement:

(a) "Commission" means the United States Atomic Energy Commission or its duly authorized representatives.

(b) "Equipment and devices" means any instrument or apparatus and includes research reactors, as defined herein, and their component parts.

(c) "Research reactor" means a reactor which is designed for the production of neutrons and other radiations for general research and development purposes, medical therapy, or training in nuclear science and engineering. The term does not cover power reactors, power demonstration reactors, or reactors designed primarily for the production of special nuclear materials.

(d) The terms "Restricted Data," "atomic weapon," and "special nuclear material" are used in this Agreement as defined in the United States Atomic Energy Act of 1954.

ARTICLE II

Restricted Data shall not be communicated under this Agreement, and no materials or equipment and devices shall be transferred and no services shall be furnished under this Agreement to the Government of ——— or authorized persons under its jurisdiction if the transfer of any such materials or equipment and devices or the furnishing of any such services involves the communication of Restricted Data.

ARTICLE III

1. Subject to the provisions of Article II, the Parties hereto will exchange information in the following fields:

(a) Design, construction, and operation of research reactors and their use as research development, and engineering tools and in medical therapy.

(b) Health and safety problems related to the operation and use of research reactors.

(c) The use of radioactive isotopes in physical and biological research, medical therapy, agriculture, and industry.

2. The application or use of any information or data of any kind whatsoever, including design drawings and specifications, exchanged under this Agreement shall be the responsibility of the Party which receives and uses such information or data, and it is understood that the other cooperating Party does not warrant the accuracy, completeness, or suitability of such information or data for any particular use or application.

ARTICLE IV

1. The Commission will lease to the Government of ——— uranium enriched in the isotope U–235, subject to the terms and conditions provided herein, as may be required as initial and replacement fuel in the operation of research reactors which the Government of ———, in consultation with the Commission, decides to construct and as required in the agreed experiments related thereto. Also, the Commission will lease to the Government of ——— uranium enriched in the isotope U–235, subject to the terms and conditions provided herein, as may be required as initial and replacement fuel in the operation of such research reactors as the Government of ——— may, in consultation with the Commission, decide to authorize private individuals or private organizations under its jurisdiction to construct and operate, provided the Government of ——— shall at all times maintain sufficient control of the material and the operation of the reactor to enable the Government of ——— to comply with the provisions of this Agreement and the applicable provisions of the lease arrangement.

2. The quantity of uranium enriched in the isotope U–235 transferred by the Commission under this Article and in the custody of the Government of ——— shall not at any time be in excess of six (6) kilograms of contained U–235 in uranium enriched up to a maximum of twenty percent (20%) U–235, plus such additional quantity as, in the opinion of the Commission, is necessary to permit the efficient and continuous operation of the reactor or reactors while replaced fuel elements are radioactively cooling in ——— or while fuel elements are in transit, it being the intent of the Commission to make possible the maximum usefulness of the six (6) kilograms of said material.

3. When any fuel elements containing U–235 leased by the Commission require replacement, they shall be returned to the Commission and, except as may be agreed, the form and content of the irradiated fuel elements shall not be altered after their removal from the reactor and prior to delivery to the Commission.

4. The lease of uranium enriched in the isotope U–235 under this Article shall be at such charges and on such terms and conditions with respect to shipment and delivery as may be mutually agreed and under the conditions stated in Articles VIII and IX.

ARTICLE V

Materials of interest in connection with defined research projects related to the peaceful uses of atomic energy undertaken by the Government of ———, including source materials, special nuclear materials, byproduct material, other radioisotopes, and stable isotopes will be sold or otherwise transferred to the Government of ——— by the Commission for research purposes in such quantities and under such terms and conditions as may be agreed when such materials are not available commercially. In no case, however, shall the quantity of special nuclear materials under the jurisdiction of the Government of ———, by reason of transfer under this Article, be, at any one time, in excess of 100 grams of contained U–235, 10 grams of plutonium, and 10 grams of U–233.

ARTICLE VI

Subject to the availability of supply and as may be mutually agreed, the Commission will sell or lease, through such means as it deems appropriate, to the Government of ——— or authorized persons under its jurisdiction such reactor materials, other than special nuclear materials, as are not obtainable on the commercial market and which are required in the construction and operation of research reactors in ———. The sale or lease of these materials shall be on such terms as may be agreed.

ARTICLE VII

It is contemplated that, as provided in this Article, private individuals and private organizations in either the United States or ——— may deal directly with private individuals and private organizations in the other country. Accordingly, with respect to the subjects of agreed exchange of information as provided in Article III, the Government of the United States will permit persons under its jurisdiction to transfer and export materials, including equipment and devices, to and perform services for the Government of ——— and such persons under its jurisdiction as are authorized by the Government of ——— to receive and possess such materials and utilize such services, subject to:

(a) The provisions of Article II.

(b) Applicable laws, regulations and license requirements of the Government of the United States and the Government of ———.

ARTICLE VIII

1. The Government of ——— agrees to maintain such safeguards as are necessary to assure that the special nuclear materials received from the Commission shall be used solely for the purposes agreed in accordance with this Agreement and to assure the safekeeping of this material.

2. The Government of ——— agrees to maintain such safeguards as are necessary to assure that all other reactor materials, including equipment and devices, purchased in the United States under this Agreement by the Government of ——— or authorized persons under its jurisdiction shall be used solely for the design, construction, and operation of research reactors which the Government of ——— decides to construct and operate and for research in connection therewith, except as may otherwise be agreed.

3. In regard to research reactors constructed pursuant to this Agreement, the Government of ——— agrees to maintain records relating to power levels of operation and burn-up of reactor fuels and to make annual reports to the Commission on these subjects. If the Commission requests, the Government of ——— will permit Commission representatives to observe from time to time the condition and use of any leased material and to observe the performance of the reactor in which material is used.

4. Some atomic energy materials which the Government of ——— may request the Commission to provide in accordance with this arrangement are harmful to persons and property unless handled and used carefully. After delivery of such materials to the Government of ———, the Government of ——— shall bear all responsibility, in so far as the Government of the United States is concerned, for the safe handling and use of such materials. With respect to any special nuclear materials or fuel elements which the Commission may, pursuant to this Agreement, lease to the Government of ——— or to any private individual or private organization under its jurisdiction, the Government of ——— shall indemnify and save harmless the Government of the United States against any and all liability (including third party liability) from any cause whatsoever arising out of the production or fabrication, the ownership, the lease, and the possession and use of such special nuclear materials or fuel elements after delivery by the Commission to the Government of ——— or to any authorized private individual or private organization under its jurisdiction.

ARTICLE IX

The Government of ——— guarantees that:

(a) Safeguards provided in Article VIII shall be maintained.

(b) No material, including equipment and devices, transferred to the Government of ——— or authorized persons under its jurisdiction, pursuant to this Agreement, by lease, sale, or otherwise will be used for atomic weapons or for research on or development of atomic weapons or for any other military purposes, and that no such material, including equipment and devices, will be transferred to unauthorized persons or beyond the jurisdiction of the Government of ——— except as the Commission may agree to such transfer to another nation and then only if in the opinion of the Commission such transfer falls within the scope of an agreement for cooperation between the United States and the other nation.

ARTICLE X

It is the hope and expectation of the Parties that this initial Agreement for Cooperation will lead to consideration of further cooperation extending to the design, construction, and operation of power producing reactors. Accordingly, the Parties will consult with each other from time to time concerning the feasibility of an additional agreement for cooperation with respect to the production of power from atomic energy in ———.

ARTICLE XI

1. This Agreement shall enter into force on the day on which each Government shall receive from the other Government written notification that it has complied with all statutory and consitutional requirements for the entry into force of such Agreement and shall remain in force for a period of five years.

2. At the expiration of this Agreement or of any extension thereof the Government of ——— shall deliver to the United States all fuel elements containing reactor fuels leased by the Commission and any other fuel materials leased by the Commission. Such fuel elements and such fuel materials shall be delivered to the Commission at a site in the United States designated by the Commission at the expense of the Government of ——— and such delivery shall be made under appropriate safeguards against radioation hazards while in transit.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed pursuant to duty constituted authority.

DONE at Washington, in duplicate, this — day of ———, 1956

For the Government of the United States of America:

For the Government of ———:

Mr. EVINS. But, I say again, the foreign governments are not required under the terms of this agreement to give back to this country the lessons in know-how and technology which they learn.

BELGIUM—WORLD FAIR

Mr. RABAUT. We have talked about this reactor for Belgium that they have ordered here in this country. They are really ordering that for the world fair they are going to be putting on.

Mr. STRAUSS. There is some question whether it is for that, or not. Initially they wished to have it at Brussels in order that the power produced might be used at the world's fair. I understand that their plans for that have changed and that it will not be located in Brussels.

Mr. RABAUT. Is that where the world's fair is going to be?

Mr. STRAUSS. Yes, sir.

Mr. RABAUT. So then they are not going to use it for that purpose?

Mr. STRAUSS. They are not going to use it for that purpose at the present time.

Mr. RABAUT. I see nothing wrong about it, but it would be their major attraction over there.

URGENCY OF MATTER IS BEING RETARDED BY AEC PROGRAM

Chairman CANNON. I think Mr. Taber has emphasized the principal consideration before the committee. He has gone through the proposed program item by item in detail and it is evident that you are not making any appreciable progress. That on practically none of these are you getting construction, and where you are getting a little construction, it is of the conventional type and not on the reactors.

Permit me to reiterate. The first thing that must be done—and now—is to build these five reactors, five large and five small.

And to build them you must first build the five pilot plants, as GE is logically doing in San Francisco for Pacific Gas & Electric, 5000 KW. You are making no progress whatever on these ten reactors. This nation is worse than at a stalemate.

These reactors are not being built and there is no assurance they are going to be built in any definite time. For instance, the one that we have been discussing in which a half dozen conditions precedent are presented by Detroit Edison. The first condition is that a bill be passed which would amend the Public Utility Holding Company Act of 1935. That demand alone could exempt the electric utilities from any obligations to proceed with early construction.

The act makes such companies subject to regulation by the SEC. The bill has been introduced by Senators Potter and Pastore.

This bill which they have jointly introduced would open the way for electric utility companies to go back into a monopolistic combine such as was outlawed by the Act.

They have cleverly introduced an element of controversy that will prevent any definite action in the near future.

Mr. STRAUSS. Mr. Chairman, the Commission is not introducing any bill.

Chairman CANNON. The gentleman is discussing a matter which is not before us at all.

Senators Potter and Pastore have introduced a bill and that bill must be passed before we can comply with a condition which the

company has laid down and which must be complied with before they start construction.

Mr. TABER. Is that correct, Mr. Strauss?

Mr. STRAUSS. I believe it to be correct in those cases where there are a number of participants as in the case of the Power Development Associates.

This means, as I understand it, Mr. Taber, that companies which are not in the public utility business, but which are putting up their money in order to see the art advanced, in order to see our country get ahead in this field, should not be penalized by becoming members subject to an act which is designed for public utility companies. That is my understanding of it.

As I say, this is a bill which has been introduced by Senator Pastore and Senator Potter. Senator Pastore is a member of the Joint Committee, a committee which is charged by the Congress with making a complete and continuous study of this problem. He has been extremely diligent in it.

I believe it to be a proper piece of legislation. I would support it if I were asked.

Chairman CANNON. Now, Mr. Taber, you know that a bill involving this proposition, a bill which would make possible a monopolistic combine such as is outlawed by the act would create a controversy.

Furthermore, such a bill goes clear beyond research; it will also exempt from the provisions of the proposed Act electric generating and transmission companies which supply power for resale by operating utilities which own them.

To get back to fundamentals, we must begin to make progress. We must get these five reactors built. We must get the first five pilot reactors built and then the big standard reactors under construction. And we can't wait.

As was said yesterday, whether it is Russia or France or England, the country that first builds a practical reactor is going to sell its products all over the world.

Mr. STRAUSS. Not unless it has uranium to sell with them. Nobody will buy the reactor without the fuel.

Chairman CANNON. We have had a proposition to buy these reactors, although as was brought out here, I think by Mr. Evins of Tennessee, the prospect is that we will be paying for them ourselves out of foreign aid funds.

Now, Admiral Rickover said yesterday that under the most favorable conditions he did not see any prospect of producing a reactor which would generate competitive electricity within ten years.

Now, as a matter of fact, if you consider carefully what he said, he went further than that. He said the reason he did not say eleven years or twelve years, is because he presumed only to testify ten years in advance. He meant by that that it could not be done in ten years and it might be much longer.

And I want to say here—and let there be no mistake about it—that this committee favors private utilities taking over this work. We do not think it should be Government operated. Let it be handled like our public buildings program.

The government started the building program and built units here and there, and immediately private industry took it up and the government was not burdened with the completion of it.

That is what should be done here. Let the government start it off and private utilities will take it over.

But what private combination, even Detroit Edison, could afford to go into a proposition which would involve such enormous investments with the prospect of realizing on those investments some ten years, or fifteen years away?

Mr. STRAUSS. Some of us may not agree with the time scale that you have just cited. There were other experts in the days when Admiral Rickover was moving ahead with his submarine plans, who predicted there would be no marine propulsion by atomic energy within the time scale within which that came into being, or even ever.

Chairman CANNON. Who predicted this?

Mr. STRAUSS. Experts in the Navy.

Chairman CANNON. He was the only man that has ever built a successful reactor. It was successful beyond anticipation and he says, it will be at least ten years before this country will learn the answer to competitive nuclear power, and he believes it will be much more——

So private industry cannot be depended upon. They do not intend to do it, as indicated by the provisions and conditions which they have laid down here.

Mr. STRAUSS. Mr. Chairman, I think if that opinion prevails generally, private industry is entitled to the more credit for the amount of money they have already spent and are willing to continue to spend for development which is so far——

Chairman CANNON. But none of them include the immediate, and I repeat, immediate, construction of the five basic types of reactors.

Mr. STRAUSS. You are mistaken, sir. You are as wrong as you can possibly be on that.

Chairman CANNON. It is construction we are talking about.

Mr. STRAUSS. That is what I am talking about. They are willing to spend their money on construction.

Chairman CANNON. There has been built at this time by private capital only the conventional facilities. Now, we feel that you must make your plans, you must change your policy. You must do something that will get these five reactors under construction. And you cannot wait. Other nations are not waiting.

We cannot wait indefinitely while the rest of the world passes us by.

Mr. STRAUSS. And we are not waiting. If that is the case you must change the basic law under which we operate, Mr. Chairman.

Chairman CANNON. You have nothing to report to us that would indicate the beginning of construction of reactors except the one this government is building, up at Shippingport.

Mr. STRAUSS. We have reported for three solid days, the record is full of our reporting.

Chairman CANNON. Name one and tell us when it will be completed?

Mr. STRAUSS. We have given you completion dates as estimated on each of these reactors and there is no contractor who will give you a precise date unless he sets it well ahead.

Chairman CANNON. You have not started a single reactor, not one, has been started, except the one at Shippingport.

Mr. STRAUSS. That is not true, sir.

Chairman CANNON. We are speaking of large-scale units. It is the large scale we must have. These small-scale, experimental units, of course, can be built anywhere.

Mr. STRAUSS. That is not true.

Chairman CANNON. You have not started a single large-scale reactor which has any prospect whatever of early completion.

Mr. STRAUSS. You have the advantage of me, sir, as chairman of this committee, I can only reassert that this law which enabled us to get into this operation is less than two years old, that negotiations were necessary; that considerations of hazard and safety were necessary; and that despite that, the staff of the Commission, American industry, and American public power groups, have shown most commendable enterprise and that there are fourteen projects in various stages of erection or negotiation or completion.

Chairman CANNON. Not one is a large-scale reactor.

Mr. STRAUSS. What do you mean by large-scale reactor, sir?

Chairman CANNON. Name one large-scale reactor on which you have started construction.

Mr. STRAUSS. The Westinghouse-Duquesne reactor.

Chairman CANNON. That is a distortion of terminology. The Government is putting up $85 million and Duquesne $5 million to be recouped in fast tax writeoff. That is at Shippingport. That is the one on which you are collaborating. That has been explained repeatedly.

Mr. STRAUSS. What is the difference?

Chairman CANNON. With the exception of the Shippingport plant, which you yourself are sponsoring, you have not begun construction of a single large-scale reactor and we must have reactors and we must have them immediately.

Mr. STRAUSS. We have started on them.

Chairman CANNON. There is a quorum call.

The committee will stand adjourned until two o'clock this afternoon, when we will hear the witnesses from the Securities and Exchange Commission.

AFTERNOON SESSION

WITNESSES

SECURITIES AND EXCHANGE COMMISSION

J. SINCLAIR ARMSTRONG, CHAIRMAN
THOMAS G. MEEKER, GENERAL COUNSEL
RAY GARRETT, DIRECTOR, DIVISION OF CORPORATE REGULATION
FRANK G. URIELL, EXECUTIVE ASSISTANT TO THE CHAIRMAN

Chairman CANNON. The committee will come to order.

Mr. Armstrong, we shall be glad to hear you.

Mr. ARMSTRONG. My name is J. Sinclair Armstrong, from Illinois.

PREFATORY REMARKS

I am presently serving as chairman of the Commission. I am accompanied here today on my right by Ray Garrett, Jr., Director of the Division of Corporate Regulation of the Commission, which

division assists the Commission in discharging its statutory enforcement obligations under the Public Utility Holding Company Act of 1935.

To Mr. Garrett's right is Frank G. Uriell, who is Executive Assistant to the Chairman of the Commission.

On my left is Thomas B. Meeker, General Counsel of the Commission.

Mr. Chairman, the other members of the commission, Commissioners Orrick, Patterson, and Hastings, would have been here today had you desired them, but they are grateful, unless you do want them, for your letting me come over without them so they may continue with the hearings and the work of the Commission that are going on this afternoon.

But I would say in the beginning that the various positions which I will describe in reference to the legislation I understand you are going to inquire about, that the positions which have been taken by me before other committees of the Congress, have been the unanimous positions, the unanimous opinions of the full membership of the commission, sir.

Thank you, sir.

Public Utility Holding Company Act

Chairman Cannon. Mr. Chairman, the committee this morning in the course of its hearings was told that the Detroit Edison Company and their group were proposing to build a breeder reactor but that they set out two conditions precedent.

Really eight conditions precedent, to their undertaking, to start construction on that project.

The foremost condition which they demanded was exemption from the Public Utility Holding Company Act of 1935.

In order to secure that exemption, of course, it would be necessary to amend the Act.

It is our understanding that this Act was put on the statute books in 1935, and has remained there without change these twenty-one years.

Now, this company requests exemption from the terms of the Holding Company Act which has been in successful administration 21 years.

Enforcement of the act is a part of your duties. What is the attitude of your commission on that proposal? It is a matter with which you are familiar through long experience.

Mr. Armstrong. Yes, Mr. Chairman, it is.

Chairman Cannon. We would appreciate it if you would let us have the benefit of your views on the proposed amendment of the act.

Mr. Armstrong. We believe, Mr. Chairman, and members of the committee, that no amendment of the Public Utility Holding Company Act of 1935 is necessary to accomplish the broad objectives which we understand are desired to be accomplished by the Detroit Edison Company and its associates.

We have testified before a subcommittee of the Committee on Interstate and Foreign Commerce of the Senate in regard to legislation, S. 2643, which was introduced by Senator Potter and by Senator Pastore.

That bill, S. 2643, was considerably broader than the objectives which we now understand are sought to be accomplished by Detroit Edison Company and its associates, and we oppose that bill.

Chairman CANNON. Of course, in addition, as you have said, to the end sought to be attained, the bill would also exempt from the Act the electrical generating and transmission companies that supply power for resale by operating utilities that own them.

So, in effect, it is a rather comprehensive modification.

Mr. ARMSTRONG. The two provisions were entirely unrelated. They represented a combination of legislative proposals in one bill with respect to two separate subjects.

The second subject that you just mentioned was the subject of legislation which was introduced in the House of Representatives in the Eighty-Third Congress, but which I believe was never reported.

That pertained particularly to the Pacific Northwest Power Company. We furnished a report to the Interstate and Foreign Commerce Committee of the Senate also opposing the provision of S. 2643 that pertained to that portion of the proposed amendments.

They are entirely unrelated.

The second portion has really no relationship at all to the atomic energy problem.

During the hearings on S. 2643, before the Subcommittee of the Interstate and Foreign Commerce Committee of the Senate, it was stated by the sponsors of the legislation, Senator Potter and Senator Pastore, that that provision which was embodied in the bill as section 5 was not being pressed by the sponsors of the bill.

Indeed, I believe the Senators stated it was being abandoned.

DETROIT EDISON UNDER THE ATOMIC DEVELOPMENT PROBLEM

Now, with regard to the Detroit Edison problem, the bill as it was originally introduced by Senator Pastore and Senator Potter, was completely revised and an amended bill has been reported by the Committee on Interstate and Foreign Commerce with the recommendation that it be referred to the Joint Committee on Atomic Energy of the Senate.

Now, the revised bill, Mr. Chairman, is limited to companies which are combining together for research purposes in the atomic-energy field and not for profit.

Our position on such a revised bill was that under those circumstances we were not opposed to it. We do feel that it is an unnecessary piece of legislation.

One of the reasons that we are of that opinion is because the standards of the Public Utility Holding Company Act of 1935 are broad and we have construed those standards as permitting certain combinations of utility companies to engage in the development of atomic generating facilities where we felt that the standards of the act were complied with.

I am referring to the so-called integration standards.

YANKEE ATOMIC ELECTRIC COMPANY

The only case that has come before us has been the Yankee Atomic Electric Company case in the New England area, and in a decision which our Commission rendered, a unanimous opinion of the Commis-

sion, in November 1955, we permitted the companies in New England to go ahead because we felt that the standards of the act were complied with.

That very fact is a complete justification in our opinion for there being no necessity for the Congress to legislate on this subject, and we do not believe that the Public Utility Holding Company Act of 1935, in any way, shape, or form, stands as a hindrance or impediment to the development by the privately owned electric industry of generating facilities.

Now, Mr. Chairman, if you will permit me, I would like, also, unless you feel my answer is insufficient, at this point, to ask Mr. Garrett, who is the director of the division, to indicate the specific technical provisions of the legislation that I have just referred to broadly so that you may have, and the record may show, a precise indication of why the commission has given the expression of views to the Congressional committees that it has.

Public Utility Holding Company Act—SEC Opinion on Exemptions

Chairman Cannon. May I ask you, Mr. Chairman, has your commission been officially asked for an opinion on the modification of the act of 1935?

Mr. Armstrong. Not on the substitute bill, Mr. Chairman, but we believe the substitute bill, which limited the matter to not-for-profit purposes and for research purposes, flowed naturally and logically from the interchange of questions by the senators and responses to those questions by us, that occurred in the two hearings before that subcommittee of the Interstate and Foreign Commerce Committee of the Senate, sir. Perhaps the suggestions were the development of that interchange of thought and of staff discussions.

Certainly it drastically restricts the scope of the proposed legislation when it is limited to not for profit purposes. We do not feel that where members conscientiously are advocating legislation, where the legislation we believe is not contrary to the public interest, as expressessed by the Congress in the Holding Company Act, we do not believe we should be too aggressive in opposing it even though we do not believe it is necessary.

Detroit Edison Company

Chairman Cannon. Has the Detroit Edison and its associates made a formal application to you?

Mr. Garrett. No, it has not.

Chairman Cannon. Is it the opinion of the commission that under the circumstances they should make application to you?

Mr. Garrett. As we now understand their arrangements, and I think we understand them in their present form pretty completely, there would be no necessity for them to make any application, because as presently constituted none of the sponsors of the project is a holding company under the Act who would be required to register.

Chairman Cannon. That being true, is there any difference in their proposition and the proposition which confronted you with the Yankee Atomic?

Mr. GARRETT. Yes, it stems from the definition of the Holding Company Act.

Chairman CANNON. In the case of the Yankee Company, a holding company was involved?

Mr. GARRETT. Yes, because several of the companies bought a sufficient percentage of securities as to require exemption. Others were already holding companies, and when a company is already a holding company and seeks to acquire securities in an additional utility company, it must come to the commission for approval.

Some of them were exempt holding companies by order of the commission which required their orders of exemption to be renewed, based upon the new situation.

So that it was substantially different. The principal difference arises from the fact that the Power Reactor Development Company, which is the corporate entity, that is to own the reactor development that Detroit Edison is sponsoring, is organized as a nonprofit corporation, and some twenty-six companies, both utilities and industrial companies, own memberships in that corporation and as members each have one vote.

Now, you query whether the membership is a security at all. I suppose it might well be a voting security. Assuming it is a voting security, nevertheless you must go to the definition of a holding company in our Act which specifies two tests for what makes a holding company.

The first test which I refer to informally as the prima facie test, says that any company which owns ten percent or more of the outstanding voting securities of a public utility holding company must register with the commission or seek an exemption from the commission.

Chairman CANNON. The Yankee Company complied with that requirement. Did they open their records to you?

Mr. GARRETT. Completely, yes, indeed. There was a full hearing on the matter.

Chairman CANNON. Under the circumstances, the Detroit Edison Company has not applied to you and you have been given no access to their records?

Mr. GARRETT. We have not, and there is no statutory need to come to us because with twenty-six sponsors, each having one vote, no one sponsor could own more than ten percent of the outstanding voting securities.

Now, to get the full picture, the second half of the definition of a holding company provides that regardless of the voting securities held of the utility, a company is a holding company if the commission finds, and this would mean finds after a hearing, that the holding company or the parent company so to speak, exercises a controlling influence over the utility company and that it is necessary or appropriate in the public interest and for the protection of investors or consumers that holding company obligations be imposed.

Now, that second part of the definition is central, as we understand it, in the concern of Detroit Edison with this problem.

As it now stands, there is no need for Detroit Edison to have come to us though it might help settle their status if they did.

There is certainly no need for them to come to us, nor will there ever be any need for them to come to us because of the Power Reactor Development Company project.

But the commission has at least the legal authority to proceed against Detroit Edison should it ever think it necessary, to find and declare that Detroit Edison in fact exercises a controlling influence over Power Reactor Development Company and that it is necessary or appropriate that holding company obligations be imposed.

We have not instituted such a proceeding. We have not talked about instituting such a proceeding. The matter has not been brought to the commission's attention in any formal way. As a staff member, I have no information now that would lead me to recommend to the commission that it institute such proceedings.

It is for that reason that we say that so far as we can understand it now there is no need for an amendment in this area.

We are assured by the Atomic Energy Commission staff—this certainly conforms to our own knowledge of the subject such as it is—that there are no other projects now proposed which would tend to run afoul of or involve the sponsors in the Holding Company Act other than the Detroit Edison project, and that will not either, unless, as I explained, we should attempt to exercise this jurisdiction which we have to declare a sponsor a holding company despite the fact that it doesn't own a sufficient amount of stock in a subsidiary to make it a subsidiary in the technical sense. We have never actually made such a declaration. Certainly we might. There is no present reason to believe that we will. Certainly it will not be our present thought to do it.

Chairman CANNON. I note in a hearing before the Joint Committee on Atomic Energy in February, that in discussing this question, Detroit Edison made the statement that:

> There is presently pending before this Congress proposed legislation (S. 2643) to make certain that neither a licensee corporation, such as Power Reactor Development Company, nor any member thereof, nor contributor thereto, will become subject to the Public Utility Holding Company Act by reason of participation in the design, construction or operation of an experimental reactor. This legislation is indispensable. Hearings before the appropriate committee of Congress are expected to be held promptly.
>
> The proposed legislation will not remove from the jurisdiction of the Securities and Exchange Commission acting under the provisions of the Public Utility Holding Company Act, any company or companies now subject to the provisions of that Act. I am advised by our counsel (and I accept their advice) that Congress in the enactment of the Act, did not intend to subject the companies engaged in this project to its provisions. I further have been advised by our counsel, and other participants have been similarly advised by their respective counsel, that the language of the existing Act might be so construed. This interpretation would prevent the broad and extensive participation of many companies in this project.

That was a statement made by the president of the Detroit Edison Company.

Now, what is the application there?

Mr. ARMSTRONG. Mr. Chairman, if I may interrupt to respond to the quotation from the president of the Detroit Edison Company, which, as I understand it, was made back in February 1956, I am just a little bit puzzled about that.

The Detroit Edison Company had never been in to see the staff of the Securities and Exchange Commission or the commissioners, or anybody connected with our agency.

We are the ones who are charged by the Congress with administering the act and interpreting it.

As a matter of fact, on the first comments we made before the Committee on Interstate and Foreign Commerce Committee at that time, on S. 2643, we did not have the facts of the Detroit Edison Company case because they never brought them to us and the facts of the Detroit Edison Company case were developed during that hearing, so I don't know on whom the counsel for the Detroit Company was relying.

He certainly was not relying on any interpretation that might have been given by the legal staff of our commission in the views that he expressed to the president of the company that the president relied on in that statement.

Now, as to the project itself, certainly the bill that was introduced by Senators Potter and Pastore, the original bill, went far beyond the "not for profit" description that he used in that statement.

I just have some difficulty in seeing the relevance of that statement to this problem as this problem now stands in the Congress today in view of this report of June 22 of the Senate committee.

Chairman CANNON. It goes even further back than that. The bill was introduced in July 1955.

On June 22, 1956, a few days ago, it was reported with amendments and was referred to the Joint Committee on Atomic Energy.

It would look as if they considered the action very much in point at this time.

Mr. ARMSTRONG. That is the Senate Report 2287, accompanying the S. 2643, amendment.

I mentioned in the earlier part of my remarks the entire original bill was stricken out and the revision is the new bill, limited to "not for profit" and limited to experimental purposes.

That is a very different proposition as I understand it, from the quotation that was just read.

Chairman CANNON. Mr. Murray.

DETROIT EDISON SEEKING AN EXEMPTION FROM THE PUBLIC UTILITY HOLDING COMPANY ACT

Mr. JAMES MURRAY. As I read this testimony before the Joint Committee on Atomic Energy, the witness of the Detroit Edison Company did not say he had advice from his counsel that they were subject to the act.

He said it was the advice of his counsel that the language of the present Act "is susceptible" to such construction.

Now, is that statement accurate?

Mr. ARMSTRONG. It depends on who is construing. My point is that if you are asking for a construction of an Act you should go to the administrative agency charged by the Congress and charged with the duty of construing it.

Mr. JAMES MURRAY. Is there any attorney in your staff who would say that the act is susceptible to such a construction as to include these companies?

Mr. ARMSTRONG. I think the testimony of Mr. Garrett, which represents the views of the division, which has just been given here, is the complete answer to that.

Mr. JAMES MURRAY. I will ask Mr. Garrett if there are any attorneys in his department that feel that the act is susceptible to the construction that it would include these people?

Mr. GARRETT. As to the particular arrangements in the Power Reactor Development project, there is hardly any room for difference in construction.

I will explain in a minute what I think that reference might be to.

As we understand the facts now with regard to the number of sponsors, it follows beyond argument that nobody owns ten percent or more of the voting securities. And if nobody owns more than ten percent of the voting securities, nobody is prima facie a holding company; nobody has to register as a holding company; nobody has to get an exemption.

Chairman CANNON. By tomorrow morning the situation might be entirely changed.

Mr. GARRETT. They could lose enough members to get themselves down to ten percent.

Also, there could be a difference of opinion as to whether the SEC should proceed against them under section 2 (a) (7) (B) to find this controlling influence which would make them a holding company despite the lack of ten percent ownership of voting securities.

Mr. JAMES C. MURRAY. I notice in the Commonwealth Edison group that there are eight companies.

Mr. GARRETT. Yes, sir.

Mr. JAMES C. MURRAY. Now, in connection with these eight companies, is the Act susceptible to such a construction that would require them to register?

Mr. GARRETT. No, because Commonwealth Edison is already an exempt holding company under the act and has organized its project so as to raise no question under the Act.

The facilities in that case are owned directly by Commonwealth Edison. And Nuclear Power Group I believe is the name of the affiliated organization they organized to help finance the project.

That group owns nothing. It is a research company only, not for profit.

The eight sponsors that you mentioned make contributions to it——

Mr. JAMES C. MURRAY. Nuclear Power Group?

Mr. GARRETT. And Nuclear Power Group in turn does its portion of the development work on the nuclear reactor.

Detroit Edison does not choose to own directly the nuclear power reactor. The reason given to us in later conferences informally was that they were not willing to undertake the potential liability burden. Whether that could be relieved by insurance, I don't know, but, nevertheless, for apparently a valid reason they elected to have the reactor owned by a separate corporation.

Mr. ARMSTRONG. For reasons apparently valid to them.

Mr. GARRETT. Yes.

Mr. JAMES C. MURRAY. If this Detroit group were six in number rather than the number they are, is the present act susceptible to the construction that they would be required to register?

Mr. GARRETT. Yes, and that, I believe, might be the point of construction to which the person whom you are quoting may have been directing attention.

There is a question as to a heat producing company—and Power Reactor Development Company solely produces heat or steam and will sell the steam to Detroit Edison, which will own the turbines and generators—there is some room for a division of opinion as to whether the definition of electric utility company in the Holding Company Act

includes a heat producing company, or, to put the emphasis in the right way: a company which only produces heat.

Now, in the testimony before Senator Pastore's subcommittee, I explained that neither the commission nor the courts had ever had occasion to rule upon the question. Therefore, there is no authoritative answer.

It is my opinion that such a company probably is a utility as a general proposition. But in exploring the matter further, and I think this is of interest, because it is directly related to the possibility of a project with ten or fewer sponsors, we have studied the later sentences of section 2 (a) (3) and have proposed a rule under our Act the effect of which would be to exclude from the definition of electric utility company any company whose only utility type assets are a heat producing reactor and which is not for profit and which is primarily devoted to research and development.

We have published that rule for comment as an attempt to clarify what we think the statute means and to clarify the need, if there is any need, for an amendment.

Mr. JAMES C. MURRAY. Now, as I understand it, there was some testimony this morning that one of these reactors that is attached to a power company is interchangeable with steam.

Would that cover them, or would they be exempt from the provisions of the Holding Company Act if their assets included a portion of the plant that could be converted to steam.

Mr. GARRETT. The turbines and generators certainly would be interchangeable, given the same pressures and the same heat. The reactor is simply a heat producer like a coal burner.

I suppose most of these projects will ultimately be established with standby steam facilities for times when the reactor may have to be shut down.

Under the rule which we have proposed the company could not get the exemption and own anything more than the heat producing reactor itself. It could not own the turbines and the generators.

Mr. JAMES C. MURRAY. Now, on this question of the Detroit group, suppose one member of that group did control ten percent, even though there were twenty-six members, could they come under the Holding Company act in that event?

Mr. GARRETT. They would come under the Holding Company Act unless we adopted the rule or acted by order.

We could act by order and they could, if they were worried about the ten percent point, have requested from us an order declaring that the Power Reactor Development Company is not an electric utility company, and I presume that the staff would recommend that the order be granted since we have come to that conclusion.

Mr. JAMES C. MURRAY. It is your conclusion that their fear is groundless as to the application of the Public Utility Holding Company Act?

Mr. ARMSTRONG. Yes.

Mr. TABER. Will you yield to me for a minute?

Mr. JAMES C. MURRAY. Yes, I will, Mr. Taber.

Mr. TABER. If the Detroit Edison Company came before you with a petition for approval of their entering into this proposition, or the Power Reactor Development Company, would you make them a ruling saying whether in your opinion they would be required to register under the act?

Mr. GARRETT. The staff itself on its present information would recommend that the commission grant an order declaring the Power Reactor Development Company is not an electric utility company as it is presently constituted, and would not be as long as it was primarily devoted to research and development.

Mr. TABER. So that that question could be cleared up by an application to the commission?

Mr. GARRETT. Yes, it could.

Mr. ARMSTRONG. I think it is most important to realize the point that you have just brought out, Congressman Taber, because somewhat similar problems were involved in the Yankee case, where there were companies there that did own more than ten percent of the reactor subsidiaries.

Mr. TABER. But you had the authority to permit it?

Mr. ARMSTRONG. Yes, sir.

Mr. TABER. In this particular instance?

Mr. ARMSTRONG. Yes, sir. They came in and made a proper evidentiary record and on the basis of the record they made, applying the intergration and other standards of the Holding Company Act, we made a finding granting them the approvals and exemptions.

We think that is the proper way it should be done, Mr. Congressman.

Mr. TABER. I do not see that that is a very serious proposition, myself.

Mr. EVINS. In view of the promulgation of the rule by the SEC, in this field, it even appears more unnecessary for them to have any misapprehensions or even to file an application.

Mr. ARMSTRONG. And our purpose in promulgating the rule for comment in accordance with the Administrative Procedure Act was, in part, to allay the fears that had developed in the testimony and to accommodate ourselves to the views of the Senators who, as I mentioned, were very sincerely and seriously concerned about the interpretative problem.

Mr. JAMES C. MURRAY. Would you say, Mr. Chairman, that anybody who predicated his refusal to proceed on a failure to obtain legislation that would exempt him from the Public Utility Holding Company Act, that his refusal was actually not founded in good faith, it appearing that he is not subject to its terms.

Mr. ARMSTRONG. Well, I would never want to challenge a person's good faith where he is concerned about interpretation of law, but I would try to allay the fears that he has.

Mr. JAMES C. MURRAY. Suppose someone who has secured a favorable ruling from you, refused to go ahead, saying, "I am not going ahead with this without legislation", now would you say that his original intent to go ahead was serious?

Mr. ARMSTRONG. I don't know. I would say to the Congressional Committee before whom the matter came in respect to possible legislation, that the person's fears were groundless and that the legislation was not necessary in the public interest.

Mr. JENSEN. Any group that bands itself together for any purpose, where no member of that group owns ten percent or more of the securities in the organization that comes under your jurisdiction, they know the laws under which they operate, they also know that should they at any time make a change in the ownership of any one in that group, to the point that an exemption did not apply, then they would

know that they would need to come to you, to the Securities and Exchange Commission, and to make such a fact known and get your ruling. Is that not a fact?

Mr. ARMSTRONG. Yes, sir; that is a fact.

Mr. JENSEN. They would know, they know right now, if they did not do that, they would be subject to the penalty under the law; is that right?

Mr. ARMSTRONG. Yes, sir.

Mr. JENSEN. I just want to say that I have been pleased to hear your testimony and the testimony of your counsel which clarifies this thing perfectly in my mind.

Mr. ARMSTRONG. Thank you, sir.

Mr. JENSEN. I think it has been a very able presentation of the facts just as they are.

HOLDING COMPANY ACT RESTRICTIONS ARE IMPORTANT

Mr. BOLAND. That is not the problem that bothers me. The problem that bothers me and I think some of the members on this subcommittee, is one in relation to the tactics that these companies may employ in getting into the development of atomic power with the speed that we think is commensurate with the safety of this nation and our security in the future.

If these companies indicate that they cannot go ahead without legislation which authorizes them to do so, which would exempt them under the Utility Holding Company Act, and if they persist in that thought, then, of course, we are not going to get anywhere with the desire of our government to have them go ahead and get in this program the way we want them to get into it. That is one of the problems that concerns me and possibly concerns some of the others.

I am concerned with the delay, with the dilatory tactics.

Mr. TABER. Let me dispel that, if I might.

All these people have to do is to make an application to the commission for a ruling. The commission can then make a ruling on the situation and do not know, the only thing that might interfere would be delay in the process of the commission.

Now, the commission could tell us about that if there is any reason.

Mr. BOLAND. Whether or not they think the particular group would come in and ask for a ruling. Have they asked for a ruling yet?

Mr. ARMSTRONG. They don't need a ruling.

Mr. BOLAND. They seem to indicate they need the legislation; is that right?

Mr. ARMSTRONG. Yes.

Mr. BOLAND. You indicate they do not need the legislation.

Mr. ARMSTRONG. Yes.

Mr. BOLAND. That is the problem.

Mr. TABER. If they got a ruling that would settle it.

Mr. ARMSTRONG. If you gentlemen would permit me to respond, I think, Congressman Boland, the Yankee case is a pretty good example of a group of companies that came in principally from Massachusetts, that is where the project is going to be, and applied as Congressman Taber suggests, for a ruling, I am awfully glad you mentioned the matter of the commission proceedings because it gives us the oppor-

tunity to point out to this most important committee of the Congress that our administrative proceedings and our agency are extremely expeditious.

The proceeding was filed a good long time before the proponents of it were ready to go ahead, before the final terms were set, and they did not ask for a hearing on it until sometime later.

But the moment they asked for a hearing on it, in the middle of August 1955, they went ahead before a hearing examiner. There was an evidentiary hearing.

There were oral argument and briefs before the commission and the commission came out with its decision on the 25th of November, and we think, if we may blow our own horn a little bit, sir, that that is very fine administration and service to the public along the lines that Congress wants the commission to act.

Furthermore, we came down with our opinion on the impact of the Holding Company Act on the problem even before the Atomic Energy Commission had given the experimental research license to this company which was a necessary ingredient of the project.

Mr. TABER. I do not want you gentlemen to feel that I was throwing stones at the commission. I was just trying to get the record so clear that we would know just what we were up against.

Mr. ARMSTRONG. Yes, sir; and that is why I responded, because we are most appreciative of the opportunity to get that in the record before this committee.

Mr. EVINS. If there is any delay in the process it is not the responsibility of the SEC certainly.

Mr. ARMSTRONG. Thank you, sir, very much.

Mr. JAMES C. MURRAY. Mr. Chairman, you cannot foresee any possible way that these people can be subject to the Public Utility Holding Company Act under your present rules and regulations; is that correct?

Mr. ARMSTRONG. That is correct on the basis of everything that we have heard about so far in terms of the manner in which these projects are to be set up and financed.

Now, what may come in the future, I don't know, but I do believe that it is appropriate for the provisions of the Holding Company Act, which give the SEC a procedural opportunity to examine whether the basic integration and other standards are being complied with, should be preserved.

I think those standards are very important in the public interest and I do not think again responding to the quotation which the Chairman of the committee read, I do not think it is a question of whether the Congress in 1935 contemplated the development of atomic energy for industrial power purposes.

The standards that are established in the Holding Company Act in regard to interlocking situations between large combinations of companies in regard to physical integration, I think, are standards which have been part of the law of land for twenty-one years, and I think are sound in the public interest.

DETROIT EDISON—POWER REACTOR DEVELOPMENT COMPANY

Mr. JAMES C. MURRAY. With respect to this Power Reactor Development Company are you familiar with all of the facts in connection with their arrangement and are you making that statement as to the

application of the Public Utility Holding Company Act with knowledge of all the facts concerning this combination.

Mr. ARMSTRONG. I would not be in a position to say we know all the facts, because there has never been an evidentiary proceeding before us on which we have had an opportunity to cross-question any applicant.

But I do believe that my statement is based upon generally the familiarity which our staff have, headed by Mr. Garrett, the director of the division, with the facts which Mr. Garrett has given as to what has been disclosed to the commission, and on the basis of all those facts I do not know how I can take a much more affirmative position than I have taken.

Mr. JAMES C. MURRAY. Maybe an objection could be predicated upon facts which you are not aware of and there is no reason for you to be aware of it. Now, is that a possibility?

Mr. ARMSTRONG. That gets into a pretty hypothetical area. I just do not know.

Mr. JAMES C. MURRAY. It does not get into too hypothetical an area when you realize that these people have represented to a Congressional committee that one of the conditions of their going ahead with the program is that they get an exemption from the law. You tell us that an exemption is not necessary. They are represented by capable counsel also.

Mr. GARRETT. One of their witnesses before Senator Pastore's committee explored this subject. I think I can explain what the company would say.

That is that they are not afraid that they are now a holding company or that any of the sponsors is now a holding company. They are afraid of the possibility, which is certainly a legal possibility, that the commission, this commission, might exercise its power under section 2 (a) (7) (B) to find controlling influence and declare them to be a holding company despite their ownership of less than ten percent of the voting securities.

There are elements in the arrangements which would provide a foundation for such a proceeding if in our judgment it were ever necessary or appropriate to bring it. They are fairly obvious. The reactor is immediately adjacent to the turbines and the generator.

Detroit Edison will buy all of the output of the reactor, all of the heat that it produces. Detroit Edison's president will also be president of the Power Reactor Development Company. Although all of the sponsors will have their employees working on the project it may well be that Detroit Edison will have more of its key employees on the project than will the other sponsors.

Putting all those elements together there is the making of a prima facie case of controlling influence if in our judgment it were ever necessary or appropriate to begin such a proceeding.

We have said, not because we were aware of no facts upon which to find controlling influence, but because we are not aware of any necessity or appropriateness in the public interest that holding company obligations be imposed, that certainly the staff would not recommend such a proceeding under the state of affairs as we now understand them and would expect them to be for some years to come.

Also, I should explain that there are two ways not to be a holding company under our act. One is not to control a utility subsidiary

and the other is to control something that is not a utility. Under our rule it would not matter whether they exercised controlling influence because Power Reactor Development Company would not be an electric utility company anyway.

I believe their response to that would be, "Well, that places our reliance upon the good judgment of the commission and upon its own rule. At another time the commission could revoke the rule and could start this proceeding and we are entitled to legislative protection against the possibility that the commission might some day take that course."

Mr. JAMES C. MURRAY. I can see the point now.

SEC JURISDICTION

The actual fact is that you do have jurisdiction over them, but with this legislation you will have no jurisdiction over them; is that a correct statement, or not?

Mr. GARRETT. Jurisdiction to start a proceeding.

Mr. JAMES C. MURRAY. That is correct, under the proposed legislation you would not even have jurisdiction to start a proceeding.

Mr. GARRETT. That is correct. Jurisdiction to start a proceeding is not jurisdiction to win a case, as you well know.

Mr. JAMES C. MURRAY. I understand that. I can see where an individual might not even want you to have a jurisdiction over him.

Mr. EVINS. In the event the commission later receives or finds facts which would indicate that they had expanded beyond research and they were not a non-profit organization, then you would have jurisdiction and it would be your duty and responsibility to proceed under the act, would it not?

Mr. GARRETT. That is right.

Mr. ARMSTRONG. That is correct, but I think it should be pointed out that meeting the integration and other standards of the act in the Yankee case, we made the necessary exemptive findings, even though in the Yankee case the subsidiary is not a non-profit corporation, and the approval and exemptions under the Act are not limited to research.

Mr. EVINS. In other words, as long as they confine themselves to research and operate on a nonprofit basis they are free of any worries.

Mr. ARMSTRONG. Yes, sir.

Mr. EVINS. If they go beyond that, then they might be subject to a proceeding by the SEC?

Mr. ARMSTRONG. Yes.

EVASION BY POWER REACTOR DEVELOPMENT COMPANY—DETROIT EDISON

Chairman CANNON. Going just a little farther along the line of inquiry by Mr. Boland and also by Mr. Murray, could the interpretation be made of the failure of the Detroit group to come before your commission, as would seem the natural course; and instead of coming before your commission appeal directly to Congress for revision of the law: could that be interpreted as an inclination upon the part of the company to retard proceedings and delay the beginning of construction of this reactor?

Mr. ARMSTRONG. I am not in a position to pass on that question, Mr. Chairman. I do not know what their motives were.

Chairman CANNON. They had some reason for failing to follow the regular routine. They would be expected to come to your commission and it was a little out of the ordinary for them to come directly to Congress. There have been no other similar instances of that kind in your records?

Mr. ARMSTRONG. I do not know. I am really at a loss. I am not trying to avoid the question, Mr. Chairman, but we just do not know.

Chairman CANNON. Is it at all possible that there is an indication here that they would prefer to delay for the present the beginning of construction of this project?

Mr. ARMSTRONG. We have no basis for any such belief and consequently I just can't express such belief.

As far as coming to the Congress is concerned, going back to high school civics, it seems to me that one of the things you learn there is that a citizen has a right to petition to Congress. It is a very basic freedom.

Chairman CANNON. John Quincy Adams established that right many years ago.

Mr. ARMSTRONG. I don't think that one should characterize, if I may say so, Mr. Chairman, that a person going to Congress rather than going to an agency, going to Congress first, is out of the ordinary.

It seems to me the first person you go to with your troubles is Congress. I just do not have any reason to challenge the way this company has proceeded in the matter.

Chairman CANNON. You cannot but be impressed by the course which they took. Here the door was wide open. The natural course would have been for them to have appeared before you and they would have secured immediate action.

Instead of doing the natural thing and the expeditious thing, they have taken the long way around and have come down to Congress and proposed a modification of law which necessarily involves not only much delay but involves considerable doubt as to its outcome.

Does it strike you that there must be some impelling reason why such an extraordinary course should be taken?

Mr. ARMSTRONG. Again I just do not know because I honestly can't say. I don't know what is in the back of their mind.

Chairman CANNON. What you mean is that you prefer not to say?

Mr. ARMSTRONG. No, sir; but I would not characterize somebody's motives if I did not know what his motives were. I have no basis to testify.

Chairman CANNON. If they wanted action. If they want action now, they should come before you long ago?

Mr. ARMSTRONG. Yes, sir.

Chairman CANNON. They did not take the obvious course of coming before you and securing immediate action, but they preferred to take the longer and more intricate course of securing action by the two Houses of Congress, and approval signature by the President. There must have been some urgent reason for it.

The only thing involved by such a course is delay, at a time, and on a project in which speed is an essential thing.

PHILIPPINE ISLANDS—URGENT NEED FOR ATOMIC ELECTRICITY

The Philippine Islands have a very high fuel cost. As I understand it, there is a dearth of native oil and native coal and their need for atomic reactors is pressing.

The General Public Utilities Corporation, which is an American holding company, and the parent of the Manila Electric Company, has been under a divestment order from your commission but up to this time has failed and refused to comply with your order.

Have they recently complied with that order or are they still recalcitrant?

Mr. ARMSTRONG. They have not complied with it. I don't think there is a failure or refusal. They have applied to the Congress for legislation which would relieve them from the effect of the order. They have not contested the legality of the order. The order is conceded by the counsel for the GPU corporation to be in all respects legal and proper.

Chairman CANNON. They likewise are trying to get out from under the——

Mr. ARMSTRONG. They have petitioned to Congress for relief. There has been legislation introduced by Representative Klein of New York on which we have testified before the Subcommittee on Commerce and Finance of the Interstate and Foreign Commerce Committee of the House of Representatives.

Chairman CANNON. While this situation is in effect they propose to build an atomic reactor in the Philippine Islands with the collaboration and cooperation of the Atomic Energy Commission and are also asking various and sundry concessions.

Just what is the status of that matter, and what is the attitude of the commission towards that proposal?

Mr. ARMSTRONG. It is my understanding that the bill has been reported favorably by the subcommittee to the full committee and the bill has been reported favorably by the full committee of Interstate and Foreign Commerce to the House of Representatives.

Chairman CANNON. Did the SEC approve the bill? Was the bill submitted to them for recommendation?

Mr. ARMSTRONG. Yes, sir.

Chairman CANNON. Was it your recommendation that it be passed?

Mr. ARMSTRONG. No, sir; the opposite. I testified in behalf of the commission before the subcommittee.

Chairman CANNON. Why did you disapprove the bill?

Mr. ARMSTRONG. We felt that the objectives sought to be accomplished could be accomplished in compliance with the Holding Company Act.

We suggested that rather than have the General Public Utilities Corporation retain their ownership in the Manila Electric Company, that the stock of the Manila Electric Company could be placed in the hands of a corporation to be organized and that the stock of that corporation to be organized be distributed by way of a partial liquidating dividend by General Public Utilities Corporation to its own stockholders, and that that would accomplish one of the basic purposes of the Public Utility Holding Company Act which in effect gave to holding companies that owned foreign as well as domestic subsidiaries the opportunity to decide whether they wanted to stay in the business of foreign

operations or whether they wanted to stay in the business of domestic operations.

Chairman CANNON. It would have been the most expeditious thing for them to have followed the regular routine? To comply with the order?

Mr. ARMSTRONG. It should have complied with the order.

Chairman CANNON. Here we have an instance in which there is delay due to their failure to comply with the order, due to their attempt to secure exemption in a way that retards proceedings and involves delay.

Mr. ARMSTRONG. I am not going to participate in such a characterization of General Public Utilities Corporation.

Again I feel that when persons are the subject, are involved in legal situations under acts of Congress and desire an opportunity to present their problem to the Congress, that it would be most inappropriate for an administrative agency attempting to carry out the will of Congress to attempt to interfere or get in the way of people petitioning Congress for relief.

I think had we attempted to enforce our order, having in mind some members of this Congress introduced legislation for relief, it would have been most inappropriate.

Chairman CANNON. As a matter of fact, were there other instances in which a company with foreign holdings received such an order and complied with the order by divesting themselves of their foreign holdings?

Mr. ARMSTRONG. Yes, sir. Some have taken the opposite course. The Electric Bond and Share System submitted plans of compliance with the simplification requirements of section 11 of the Holding Company Act. It decided to submit plans that would permit that company to maintain its foreign properties and divest itself and distribute out to its stockholders the shares of its domestic subsidiaries. I believe that it was that sort of choice which Congress gave to holding companies having domestic and foreign properties when it passed the Holding Company Act. That is the American Foreign Power Company which is still maintained as a holding company system under the Electric Bond and Share Company.

Chairman CANNON. In this case the utilities companies by following the same course could have expedited proceedings?

Mr. ARMSTRONG. I think one must be careful about characterizing them because we must remember that although the order of divestment of the Securities and Exchange Commission was entered into in the early 1940's, it was in 1941 that the Philippine Islands fell under the very serious and terrible conditions of Japanese invasion and their properties, the Manila Electric Company properties, were substantially destroyed. There was a period after the Japanese surrender when it was necessary for these properties to be rehabilitated during the late 40's and the Securities and Exchange Commission did not, during that period, take an aggressive or a punitive attitude toward General Public Utilities Corporation, because our commission I believe recognized the necessity for doing everything we could to rehabilitate the unfortunate people, the people who had been in an unfortunate position in the Philippine Islands by reason of that invasion. It was not until late 1951 that the Commission finally placed against General Public Utilities Corporation a mandate with an instruction that the divestment be completed promptly.

Mr. RABAUT. If it had not been for the condition in which they were as a result of the war, you would not have taken that attitude?

Mr. ARMSTRONG. I believe the Commission would have pressed much harder.

Mr. RABAUT. It was something that grew out of the circumstances at that time?

Mr. ARMSTRONG. Yes, sir.

Mr. RABAUT. You sort of bypassed your regular treatment?

Mr. ARMSTRONG. I think so.

Chairman CANNON. Your report was a written report?

Mr. ARMSTRONG. Yes, sir.

Chairman CANNON. You can supply that report?

Mr. ARMSTRONG. Yes, sir.

Chairman CANNON. Conventional fossil fuel plants of the Manila Electric Company, and that is the company of which this is the parent company, now under construction or authorized are expected to take care of electricity requirements through 1958. Recent engineering studies indicate that still further capacity will be required by 1959 or 1960 and our hope is that this need can be met by a nuclear plant. What would you say to that?

Mr. ARMSTRONG. Will you answer that, Mr. Garrett?

Mr. GARRETT. The significant thing to us is that there is no proposal, so far as we are aware, by General Public Utilities to do anything that could not be done in that regard by a separate holding company whose only asset was the shares of the Manila Electric Company. They do not intend, if we understand them properly, and they describe it as a commercially feasible project, to use any American capital resources presently in their hands for the purpose of financing research or doing any act of charity with regard to the Manila Electric Company. I should think that a commercially feasible atomic power project could be achieved by any American management of Philippine properties. They have capital resources that are very good in the Philippines. Of course they have a dollar problem of getting pesos into dollars to get American materials. But I do not see anything in General Public Utilities' ownership of the situation that is essential to the going forward with such a project as they suggest.

Mr. ARMSTRONG. I would like to add to what Mr. Garrett has said, that I think the comments of the Securities and Exchange Commission on this problem should be in specific reference to the Holding Company Act only. We are not in charge of the foreign relations of the United States and the position of the Department of State is another matter. We have not got responsibility for the defense of the United States, and what the Defense Department and the Atomic Energy Commission may have in mind is beyond our responsibility. That is for them to say. Our comments on this subject are limited to our jurisdiction under the Holding Company Act.

Mr. RABAUT (presiding). The committee will now recess——

Mr. ARMSTRONG. Mr. Chairman, before you lower the adjournment gavel, if I may, in response to the question which Chairman Cannon was asking as the committee recessed a few minutes ago, I want the record to be perfectly clear that there should be no implication or suggestion taken from the testimony I have given about the motives

of anybody. Now these Detroit Edison people came down here, they have competent counsel, presumably. One of their witnesses was a very learned gentleman, a law school dean, the Dean of the Law School of the University of Michigan.

Mr. RABAUT. The witness is aware that I come from Michigan, is he not?

Mr. ARMSTRONG. I confess, Congressman, I should have been aware but, as a matter of fact, I am not. What I am trying to illustrate is that I don't think there should be a characterization of people who have legal problems as to their motives, at least certainly not by our agency. And what the Detroit Edison people, as I understand it, did not want to do, was to have to submit to proceedings before the Commission of the character that the folks from Massachusetts in the Yankee case were willing to submit to. I am not going to characterize the Detroit people or look into their motives. That is their position. I think it is pretty important not to characterize their motives or imply that they are bad. After all, there are two members of the United States Senate that introduced legislation on this subject. I think those considerations are very important, at least so far as any testimony I give you is concerned.

DETROIT EDISON'S RELUCTANCE—SEC JURISDICTION

Mr. JAMES C. MURRAY. I would like to bring out in the record at the conclusion of this statement that I certainly did not, nor did the chairman, make any implication as to the motivations of anyone in seeking legislation. It is the fundamental right of an individual to request legislation. At the start of this hearing I could not understand why an individual or a group of individuals or a corporation would delay going ahead with a project so important to them and to the rest of the country and predicate their agreement to proceed upon a condition that your testimony revealed was unnecessary. Your original testimony disclosed they had nothing to worry about. The further development of your testimony shows that these people are subject to your jurisdiction. It now appears that the reason they request us to pass legislation exempting them from the provisions of the Public Utility Holding Act may not be the fear that the Act would be applied to them, but to escape its jurisdiction. That is a serious matter which should be considered in the light of whether or not we are going ahead with the Atomic Energy Program as quickly as our public welfare requires.

Mr. ARMSTRONG. Congressman, the assumption that there has been any delay I am not in a position to respond to. That is another thing I wanted to say before the record is closed, Mr. Chairman. Because so far as I know or as far as has been presented to us, the coming of this group to Congress for legislative amendment has not been related to any lag in the construction of anything. I do not even know whether they are licensed at the present time to go ahead with this thing by the Atomic Energy Commission.

Mr. RABAUT. We do not feel that your agency has had anything to do with any delays that were talked about.

Mr. ARMSTRONG. That is fine. Thank you very much, sir.

SEC Proposed Rule Revision

Finally, for the record, if the committee desires there could be included in the record the rule revision of the Security and Exchange Commission which was referred to. We would suggest that that be a portion of the record.

Mr. Rabaut. Without objection we will put it in the record at this point.

(The document referred to follows:)

[For immediate release Friday, June 15, 1956]

Securities and Exchange Commission,
Washington, D. C.

PUBLIC UTILITY HOLDING COMPANY ACT OF 1935

Release No. 13200

Notice of Proposal To Amend Rule U–7 To Provide for a Class of Companies Deemed Not To Be Within the Definition of "Electric Utility Company"

Notice is hereby given that the Securities and Exchange Commission upon its own motion is considering amending Rule U–7 under the Public Utility Holding Company Act of 1935 which excludes certain classes of companies from the categories of "electric utility company" and "gas utility company" as defined in the Act. The proposal to amend Rule U–7 is made pursuant to the provisions of Sections 2 (a) (3) and 20 (a) of the Act.

Rule U–7 excludes from the categories of "electric utility company" and "gas utility company" certain companies primarily engaged in other businesses. The rule provides, in paragraph (a), that such companies, although having a certain amount of public utility business, shall not be deemed electric or gas utility companies if their gross sales of electric energy or gross retail sales of natural or manufactured gas did not exceed $100,000 for the previous calendar year, which amount is computed after excluding certain classes of transactions specified in paragraph (b) of the rule.

The proposed amendment to the rule specifies a new class of companies which would be excluded from the category of "electric utility company," namely, certain companies whose only connection with the generation, transmission, or distribution of electric energy is the ownership of facilities used for the production of heat from special nuclear material which heat is used in the generation of electric energy and which companies are organized not for profit and are engaegd primarily in research and development activities. Companies not otherwise subject to the Act would not become subject to the Act as a result of participating in research and development activities with respect to electric energy generated through the utilization of nuclear material.

The proposed amendment to the rule would delete "(b)" and the words "in paragraph (a)" from the first sentence of the second paragraph of Rule U–7 and would make that sentence a part of the preceding paragraph. A new paragraph (b) would be added to read as follows:

"(b) (1) Any company whose onlyconnection with the generation, transmission, or distribution of electric energy is the ownership of facilities used for the production of heat from special nuclear material which heat is used in the generation of electric energy shall not be deemed an electric utility company within the meaning of Section 2 (a) (3) of the Act if such company is organized not for profit and is engaged primarily in research and development activities.

"(2) As a prerequisite to being entitled to the status afforded by subparagraph (b) (1) above, any such company shall file with this Commission a statement that such company falls within the provisions of that subparagraph, including as exhibits (i) copies of its charter, by-laws and any licenses issued by the Atomic Energy Commission to such company; (ii) a list of its members or stockholders indicating their respective percentages of voting power; and (iii) a balance sheet as at the end of the preceding calendar year and an income and surplus statement for such year.

"(3) As a prerequisite to retaining the status afforded by subparagraph (b) (1) above, any such company shall annually on or before May 1, file a statement with

this Commission that such company continues to fall within the provisions of that subparagraph, including as exhibits (i) any changes or additions to its charter or by-laws or list of members or stockholders or any licenses issued by the Atomic Energy Commission to such company since the time of the last filing hereunder, and (ii) a balance sheet as at the end of the preceding calendar year and an income and surplus statement for such year.

"(4) If it appears to the Commission (on the basis of the aforesaid statements or otherwise) that a substantial question of law or fact exists as to whether any company is entitled to the status afforded by subparagraph (b) (1), the Commission may notify such company to that effect by registered mail. Thirty days after such notification the status afforded by subparagraph (b) (1) shall no longer be available to such company, without prejudice to the right of such company to file an application for an order granting an exemption from the application of Section 2 (a) (3) of the Act, and without prejudice to any temporary exemption provided by that section if such an application is filed in good faith. The Commission will grant such an application if it finds that the standards set forth in subparagraph (b) (1) above are satisfied."

* * * * * * *

All interested persons are invited to submit data, views and comments on this proposal in writing to the Secretary, Securities and Exchange Commission, Washington 25, D. C. on or before July 6, 1956.

By the Commission.

ORVAL L. DUBOIS, *Secretary.*

Mr. RABAUT. You are going to give us the report on the General Public Utilities?

Mr. ARMSTRONG. Yes.

Mr. RABAUT. Do you want that in the record or just for the information of the committee?

Mr. JENSEN. It is up to you, Mr. Chairman. I have no objection.

Mr. ARMSTRONG. It is in the record of proceedings of the Interstate and Foreign Commerce Committee.

Mr. RABAUT. We will decide on that.

The committee is adjourned.

FRIDAY, JUNE 29, 1956.

MILITARY SIGNIFICANCE OF NUCLEAR ENERGY

WITNESS

REAR ADM. H. G. RICKOVER, CHIEF, NAVAL REACTORS BRANCH, DIVISION OF REACTOR DEVELOPMENT

Chairman CANNON. The committee will come to order.

Can we have Admiral Rickover. We were to conclude his testimony this morning.

Admiral Rickover, continuing your testimony, I note in this morning's Washington Post, the issue of Friday, June 29, 1956, that we have an official statement which has been censored and cleared by the Defense Department, under which the Army estimates that a full scale nuclear attack on Russia by American bombers would kill several million people, including many in surrounding free world countries.

The Army says in its release this morning:

> Depending upon which way the wind blew, the lethal dust would fall on Western Europe or cross Asia and hit Japan and possibly the Philippines, Lieutenant General James M. Gavin told a Congressional subcommittee.
>
> Gavin, the Army's research and development chief, also said he agreed with a published study that 110 H-bombs dropped on the United States would destroy or maim seventy million people and make various areas uninhabitable for a generation.

That being true, Admiral Rickover, there is a natural possibility that in the near future and especially in view of recent developments in Russia that an international concert may be entered into under which the H-bomb and the atomic bomb will be outlawed in warfare.

That would mean that in case of another war which we trust will never come, but in preparation for which we are spending billions of dollars, if we were restricted to conventional weapons, the nation or group of nations with the greatest energy potential might have a distinct advantage.

Do you think that in the event of the outlawing of H-bombs and atomic bombs, the studies which we are now making of nuclear energy or atomic energy, would have any determining influence in a war with conventional weapons?

Admiral RICKOVER. Mr. Chairman, you, of course, understand that I am not an authority on atomic bombs, either A-bombs or H-bombs, nor on any military features of atomic energy. My sole concern has been with the development of naval reactors and the Shippingport reactor.

So I will try to answer your question with that understanding. I am not an expert along that line. There are many people here from the Commission who are more familiar with these matters than I am.

Chairman CANNON. I will say, Admiral Rickover, that while that may be true, in the opinion of this committee and in the opinion of the country, you have made the greatest progress and have achieved the greatest success in the field of application of nuclear energy of anyone in the nation. On that account we are very anxious to have your opinion as to what would be the advantage of a country with a high nuclear energy potential in case we were restricted in the next war to conventional weapons.

Admiral RICKOVER. May I answer this in my own way, sir?

Chairman CANNON. If you will.

Admiral RICKOVER. In my opinion, there is no question that the nation which has the greatest control over energy sources of all kinds is in the position to become the dominant nation.

Chairman CANNON. Is that both military and industrial?

Admiral RICKOVER. Well, you can't separate the military aspects from industrial aspects, because as often has been said, the military part is simply the cutting edge of the sword. The entire military posture of the country consists not only of the Army, Navy, and Air Force, but also of the agricultural, industrial, educational, cultural, and political institutions that stand behind them.

If you don't have sources of energy, then you don't have a strong industry and you can't have a strong military.

I think this is almost self-evident.

Mr. PHILLIPS. Including agriculture?

Admiral RICKOVER. Yes, agriculture, the social institutions, the political framework. They all add up to the strength of the country.

Several hundred years ago a nation's strength was measured by the number of soldiers, the weapons, the bows and arrows you had. But today it takes such a large industrial potential to keep a man fighting that this has become the sum of the whole thing. It is everything.

As I said the other day, I am firmly convinced there is an impending world shortage of energy, not in the next few years, but it is coming sooner than we expect. One way of reversing this imbalance is the development of atomic energy.

Now, to get back to your first point, concerning the assumption there will be no nuclear wars, I have read statements by our Secretary of State that in that event the thing this country ought to do is to take the lead in the world in cultural things and in assisting other countries to develop their sources of energy so that they can improve their own economics and thus live better. If we can get other people in the world to live better than they do now, there will be less stress and less danger of war.

So I would say that it is very important for us to develop any new sources of energy. This not only will add to our strength from a military standpoint, but will also help us in our standing relative to other nations of the world.

Mr. ANDERSEN. Mr. Chairman, might I make a comment?

Chairman CANNON. Mr. Andersen.

Mr. ANDERSEN. Admiral, you would say that bringing into being of sufficient atomic energy would be on such a gradual scale as not to disrupt too much our present sources of energy? I am referring to the coal and fuel industries. They will be gradually assimilated as time goes along, so that you do not look for any great disruption of our present economic system because of atomic energy coming into being, do you, sir?

Admiral RICKOVER. Definitely not, sir.

I would say that the demands for energy of all kinds are going to be so great that, were atomic energy available today, we could use our fossil fuels, such as coal and oil, to much better advantage than burning them. We should use them as chemicals rather than fuels. To put it in a rather facetious way, I would advise a young man not to hesitate to buy coal stocks.

Chairman CANNON. Mr. Jensen.

Mr. JENSEN. I have heard it said often that the victors in every war were the nations that had the greatest supply of feed, food, and fiber. As near as I can ascertain from history, that is the fact.

I have often heard it said the North whipped the South, were victors over the South in the war between the states, because the South was starved out, so to speak.

In reading the history of that war, especially during the last year or so, we know that the South suffered greatly because of the lack of feed, food, and fiber.

Now, there are many people that worry about the surplus of grains, of feed, food, and fiber, that we have. I have never worried about it, especially so long as we have more or less of a cold war going along in the world.

I think the Lord has blessed us with this abundance of these farm products and has made it possible for us to gain friendships around the world by sending them food and fiber, and I think we have gained more friends by sending them food than by any other things we have done.

Now, there is another thing along the line that Mr. Andersen just spoke of. We have great multiple purpose projects in this nation and they are good.

Generally speaking, they are good for the economy of the country as a whole. Now, should the time ever come when atomic energy would replace a hydroelectric dam, for instance, then, of course, we would have quite a problem in raising the revenues to pay for irrigation, flood control, recreation, and the like, which is not reimbursable.

Since we do have a supply of power, electric energy, in every section of this country, no one is asking for power that cannot get power, whether it be industry, farmer, or housewife.

So I see where you should not attempt, even if we could, something in haste, and replace many of these projects producing power with conventional methods by atomic energy. We are not in a critical condition so far as power is concerned in this country by any stretch of the imagination.

I think the Commission is doing the right thing in experimenting with these different methods of producing atomic power in their attempt to ascertain the best method which can be used.

But will you agree, Admiral, that the victor of every war in recorded history, that is, in any war of consequence, has been the nation that had the greatest supply of food, feed, and fiber?

Of course, it takes other things, also.

Admiral RICKOVER. It has in the past, but I am not so sure that the three F's will hold in the future, because technological advances are being made so rapidly that it may be that the nations that have learned to exploit inventions fastest are the ones that will win, rather than the nations that have a larger store of these three F's.

For example, it is now the case that new inventions are discovered in different countries of the world just about the same time. So the nation that is able to exploit them the fastest is the one that may win, rather than the one that has the largest industrial capacity.

If a war were to be fought by means which make it last a long time, I believe your thesis of the three F's is correct, but if there is a short war, and there have been occasions in recent history where if either side had taken full advantage of what they could have done, they could have ended the war shortly.

There are four good examples of this in the two last world wars. The first is the use of poison gas by the Germans. Had they realized what they could have done they could have won the First World War in France in 1915.

The second one was the use of submarines by the Germans. There are two more. One is the use of magnetic mines by the Germans in the last World War. They almost won the war with magnetic mines, but they started a little too late, and then they did not pursue it hard enough.

The last case was the use of the V–2 bomb. If Hitler had concentrated on that, he would have won the war.

In General Dornberger's book he quotes Hitler as saying that he only apologized to two people in all his life. One apology was to the German Chief of Staff who advised him two or three years previously to concentrate on the V–2 weapons, and the second was that to Dornberger himself, who headed the V–2 program. Hitler said he realized then, when it was too late, that he could have won the war had he started development of the V–2 weapon two years earlier when urged to do so.

My thesis is that it is possible today for a nation to win a war without necessarily being superior in those three F's.

Mr. JENSEN. Of course, Mr. Hitler became a madman.

You know the old adage is that he whom it is God's wish to destroy, they first make mad.

I wonder if there was not a third reason why Hitler lost the war. He just was not on God's side. I am sure that had a lot to do with it.

Chairman CANNON. As Admiral Rickover has indicated, the development of the power to produce required electric energy will probably be the most vital factor in the next war. At the same time, it seems to me that Mr. Jensen has emphasized one of the most important considerations in this hearing.

FARMER'S VITAL AND URGENT NEED FOR ATOMIC ELECTRICITY

Today America's farms are on the threshold of the next stage of the rural electrification program in which electricity will not only make possible a modern farm home, but also modern electrified operations on a scale scarcely dreamed of when extension of electric service to all farms was first undertaken.

This is going to be of great advantage to the economical operation of the farm, as well as the financial strength of rural electric cooperatives, and that cannot be emphasized too strongly.

An unlimited supply of wholesale power at a stabilized low cost is of major importance to the next step.

I know Mr. Jensen agrees with that because I have heard him express the same thought many times.

Federally developed atomic power could within a few years equalize the cost of power supplied to rural electric cooperatives at levels which would enable their managements to offer rate schedules low enough for the farms of the country to share equally in the coming electrical age.

Plants in this capacity range, that is, plants adapted to supplying this rural power—and I would take for granted that meant small size plants with a capacity of, say, from five thousand to forty thousand kilowatts—plants in this capacity range are required to satisfy the needs of domestic rural areas with high power costs, and for the majority of foreign applications.

I will not take the time of the committee to read it, but I would like to include in the record at this point a statement made by Mr. Leland Olds, former Chairman of the Federal Power Commission, and former member of the President's Water Resources Policy Commission.

(The data referred to is as follows:)

In terms of rural electrification, you must add the economies and conveniences of the electrified farm operations, saving manpower, feed, number of pigs raised per little, and the quality and quantity of hay, grain, and feed output. Examples of electrification of farm operations which is proving that it pays off include:

(1) Complete electrification of dairy barns with electric feed handling, electric milking, electric cooling, and other care of milk, and electric barn cleaning.

(2) Complete electrification of poultry operations from the brooder to the delivery of the eggs, graded, air-conditioned, and boxed.

(3) Complete electrification of the brooding and fattening of hogs, including infrared lights insuring survival of at least one more pig per litter; and air-conditioning of the hogs assuring more rapid fattening and materially reduced feed per pound of weight.

(4) Electric chopping and handling of silage, grinding, and mixing of feed, cutting and curing of hay, drying of grain, and so forth, assuring retention of maximum of nutriment in hay and harvesting of grain at the top of its quality.

(5) Supplemental irrigation to free crops from the uncertainties of rainfall at the time when required for optimum development.

There are many other labor-saving and quality-preserving uses of electricity depending on the characteristics of the modern farm, including stock watering and the farm machine shop for maintaining all the equipment.

Chairman CANNON. Then I would like to ask Admiral Rickover a question and I will say in that connection that we have all been impressed with the view that any major development, whether in weapons or atomic power, or industrial application, should be under civilian control. That is the reason why the Congress set up a civilian commission.

I would like to ask Admiral Rickover if he thinks this development should be under military control, or have we followed the right policy in placing it under civilian control?

Admiral RICKOVER. I think that Congress was very wise in putting all this development under civilian control. It is my considered opinion that if you had placed these developments under the military, they would have taken much longer to accomplish.

I will give you my reasons for this.

The highly scientific and technical work in this country is done by civilian engineers and scientists. The military people, as a rule, are brought up in an atmosphere which tends to make them order things to be done, and you cannot order research and you cannot order development, and you cannot order people to think.

I think for the future good of this country that any new atomic developments, whether it is in weapons or whether it is in nuclear propulsion for naval vessels, for airplanes, or for the Army, should be under civilian control.

To be specific, I can say this: that had it not been for the assistance of the Atomic Energy Commission and the ease with which we have been able to operate and with a minimum of administrative interference, we never would be anywhere near as far along as we are today in the naval program.

I can talk specifically about that program because that is something I am as familiar with as anybody in this room.

I strongly urge there continue to be civilian control over these nuclear developments. I am talking about new developments and not of the making of duplicate copies.

I am addressing myself only to the research and development part.

Chairman CANNON. In your opinion the delegation of this function to the military services might have resulted in such absorption on their part in the weapon phase of it that they might have unconsciously overlooked the importance of industrial application which has been so appropriately emphasized by the civilian Commission?

Admiral RICKOVER. It is not entirely that. It is my judgment that a civilian organization is better equipped to do major items of research and development than is a military organization.

I agree with you that the military certainly would not have been, and they naturally should not have been, as anxious to develop civilian power production as a civilian organization. I think this is something that can be readily understood.

I am talking in a broad sense that generally military people are trained to do military things, and research and development is not something which is within the major training of military people.

We can assist more. The military must, of course, participate in military research and development, and I hope that these remarks are not interpreted to imply that I am against the military engaging in research and development. I am merely saying how I think it

should be done. But in the specific case of reactors for military application, I think it would be far better to keep it under civilian control; we will get there faster.

Vital Importance of Atomic Energy

Chairman Cannon. It is your conviction, Admiral Rickover, that in the event of the elimination of the atomic bomb and its associate weapons, and the necessity of fighting the next war with conventional weapons, a knowledge and understanding of atomic energy would be of vital importance and might possibly be a determining factor in winning a war.

Admiral Rickover. Since atomic energy today is on a higher plateau, in that its technical aspects are generally more advanced than ordinary industrial processes, it would help any country that had a great familiarity with it to increase its industrial posture.

Assuming there is a war where the 3–F theory applied, it certainly would help. That is in a conventional war which is not settled in a matter of hours or days.

Urgent Need of Cooperating With the Scientific and Administrative Problems of Admiral Rickover

Chairman Cannon. May I say, Admiral, the committee is impressed with what you have done and what you are doing and we feel it is vitally important to the Navy and to the country, both for the development of military and commercial atomic power.

We have followed your work with great interest and shall continue to do so. We feel it is incumbent upon the Department of Defense—and we want to emphasize this—the Department of Defense, the Department of the Navy, and the Atomic Energy Commission—to back you in your efforts. You are engaged in the building of the only major reactor now actually under construction.

Under no circumstance should any bureaucratic procedure be permitted to stand in the way of the important work you are doing for the Nation. We want you to know that this committee is interested in your program; that we are watching your progress with the greatest interest and that we support you to the fullest extent.

We urge you to come to us any time we can be of service. You are getting results that are indispensable to the welfare and security of the Nation.

Admiral Rickover. Thank you, sir.

(Discussion off the record.)

Submarine Reactors

Admiral Rickover. The *Seawolf* reactor uses a different physics principle than the *Nautilus* reactor, and it also uses a different coolant. The *Nautilus* uses ordinary water as the coolant. The *Seawolf* uses liquid metal.

Size of Reactors

Mr. Phillips. There is considerable discussion here about whether we should build a lot of small reactors or whether we should build large reactors, small being designated in the neighborhood of five thousand kilowatts, and large, one hundred thousand or 120 thousand kilowatts, or whether we should build both.

I gather from the discussion of the last several days that that is what we are talking about.

Would the building of a number of small reactors take the place completely of the building of the large reactors, and I speak entirely from, let us say, a research and experimental standpoint, that is, would it move us along rapidly in the field of experimental development, or, to put it the other way, is it not necessary that we have the building of large reactors, just to see where we are going with nuclear power and how rapidly?

Admiral RICKOVER. It is a question of time as Mr. Vance, Mr. Murray, and the Chairman said the other day.

I think that we should build small and large reactors. Theoretically, when we started on the Shippingport reactor, it was to be a step from the *Nautilus* reactor. It has turned out to be completely different in concept and design. It has been very difficult and we have learned a great deal of reactor technology which is of value for all power reactors.

The problems have been entirely different. We learned a vast amount of technology that we would not have learned from a small reactor; however, you will learn from both of them.

Mr. PHILLIPS. Let me ask a third question.

FOREIGN COUNTRIES—REACTOR INTEREST

I have read with some interest and some astonishment a report on Senate hearings that somebody apparently on the other side of our Capitol wants us to take off and build some of these reactors abroad.

Now, I have to translate these things into simple language that I can understand myself. The reason I was away yesterday was because I was over in Philadelphia for a meeting of a board of directors, where we planned to have in operation, in about three weeks, the first of a new piece of equipment which may have a very marked influence on the dairy industry. Our whole discussion was how close can we get the first installation to our engineers, our scientists, and specialists in that area, and we did not want to put it even as far out as Minnesota or California.

Does this not apply here? Our engineers and our specialists, the people with the technical knowledge if some little bug develops, are we going to put ourselves in a position to have to fly an airplane full of engineers and specialists to some foreign country to fix up some minor detail of an experimental plant that for some unknown reason we have built in a foreign country?

As a research scientist and experimental developer of the results of research, or practical developer of result of research, does that sound to you as a sensible thing to do, to stick experimental plants all over the world?

Admiral RICKOVER. I would start in by doing it in this country. I would not put one in a foreign country that we had not built and operated here, first.

Mr. PHILLIPS. In general, would you approve the program that the Commission has in mind—do you think that is a good development, nuclear development program, the one which the Commission is working on?

Admiral RICKOVER. Mr. Phillips, you know that you are asking me a question which borders on policy. My work has been technical. It has been confined to the naval program and Shippingport.

Mr. PHILLIPS. I will withdraw the question.

(Discussion off the record.)

Mr. PHILLIPS. Admiral Rickover, you seemed to give me considerable credit for the appropriation of money a few years ago for this. I want the understanding to be that it goes to the entire subcommittee. I was just the Chairman and it was a subcommittee action. This was the situation:

The budget had come down without money in it. I think the matter had not come up that early.

Admiral RICKOVER. This is for the PWR you are talking about?

Chairman CANNON. That is right. That is for the first reactor we built.

Mr. PHILLIPS. Mr. Cole of New York, who was then the Chairman of the Joint Committee, came over in very great urgency and talked to me privately and said it had become necessary, no matter what the Budget Bureau thought, or anybody else thought about putting money in, because we should establish the fact that we were spending money to develop reactors for commercial uses, that is, reactors for peace, rather than spending our money for atomic energy for war.

We thought that was a good idea and we put the money in the budget.

RUSSIAN PROGRESS WITH ATOMIC ENERGY

Chairman CANNON. Admiral Rickover, is it your impression that the Russians are making progress in the development of atomic energy?

Admiral RICKOVER. Yes, sir; they are making rapid progress. I think one of the things that drives them is that they want to become the leaders in supplying atomic energy plants to nations within their own orbit and to other nations that they hope to get within their orbit.

I think this is probably the most compelling reason for them to do it, that is, to be the first, not only from a propaganda standpoint, but also to reap the advantage in this cold war.

Chairman CANNON. As an evidence of what might be expected from them, they are developing all industrial lines and are speeding up mechanical production, including automobiles.

Admiral RICKOVER. If military weapons are to be used as an example, and these are generally the most difficult industrial products to produce, they certainly are producing excellent military weapons. So the major difference between Russia and the United States today, from an industrial standpoint, is volume rather than quality.

Chairman CANNON. Thank you very much, Admiral Rickover.

FRIDAY, JUNE 29, 1956.

SAFETY OF FAST BREEDER REACTOR

WITNESSES

ATOMIC ENERGY COMMISSION

LEWIS L. STRAUSS, CHAIRMAN
THOMAS E. MURRAY, COMMISSIONER
WILLARD F. LIBBY, COMMISSIONER
HAROLD S. VANCE, COMMISSIONER
K. E. FIELDS, GENERAL MANAGER
WILLIAM MITCHELL, GENERAL COUNSEL
W. K. DAVIS, DIRECTOR, DIVISION OF REACTOR DEVELOPMENT

Chairman CANNON. The committee yesterday, in order to permit Commissioner Murray to meet his engagements, excused him from

the session. We devoted a part of the day to the discussion of a fast breeder reactor and the possibility that Detroit Edison provide it.

We shall appreciate anything he can tell us about the importance of securing at the earliest possible date a fast breeder reactor and the prospects at this time of carrying out that program.

Commissioner Murray.

Mr. THOMAS E. MURRAY. As I explained to the committee counsel, I was sorry I had to be absent yesterday. It was an engagement that was made quite a while in advance of your hearing.

I have not had a chance to read the record that was made in relation to the fast breeder reactor. I do, however, appreciate that the development of a fast breeder reactor, which generates more fissionable material than is burned up, is a very important item in this whole concept of atomic energy.

I want to call your attention to the fact, however, and I do not think this was brought out, that our Reactor Safeguard Committee, which is the watchdog committee of all reactors—all reactor designs must be submitted to the Reactor Safeguard Committee to get their approval before we will grant licenses or construction permits to go ahead—on June 6, 1956, had the following comments to make about the present development of the fast breeder reactor as conceived by the Detroit Edison group.

With your permission, I would like to read just a couple of short paragraphs from that letter, which indicates the uncertainty, at least in my mind, of getting any such fast breeder reactor at an early date. It says:

From this review—

and they are talking of the review which the Reactor Safeguard Committee made—

conclusions are derived, No. 1, even though there are no facts or calculations available to the committee that clearly indicate that the proposed reactor is not safe for this site, the committee believes that there is insufficient information available at this time to give assurance that the PRDC reactor—

which is the Detroit Edison reactor—

can be operated at this site without public hazard.

No. 2, they state:

It appears doubtful that sufficient experimental information will be available in time to give assurance of safe operation of this reactor unless the present fast reactor program of the AEC is amplified and accelerated as detailed below.

No. 3, they say:

It is impossible to say whether or not an accelerated program would give sufficient information to permit safe operation of this reactor at the Lagoona Beach site on the time schedule presently proposed.

Now, in that same letter, it ends up with this statement:

But the committee—

meaning the Reactor Safeguard Committee—

does not feel that the steps to be taken should be so bold as to risk the health and safety of the public. It is important for the AEC to provide sufficient development facilities and experimental information that the safety aspects of the PRDC reactor can be reliably appraised in advance of operation of the reactor itself.

Now, I read that statement to bring out the fact that there is grave doubt in the minds of the Reactor Safeguard Committee that the present design, as presently proposed by the Detroit group, will work in a satisfactory and safe manner.

Money Must Be Provided Now

Now, I want, if I could, to move to another point which has a definite relation to this. I refer you back to my statement that I submitted here on June 25, 1956—which was a week ago Monday. I would like to repeat, if I could, in order to point up this situation.

The figure for research originally, this is our original budget figure that we submitted to your committee for consideration—the figure for research and development was thirty-eight million dollars, and the figure for construction was zero.

Subsequently, in the latter part of April—that is only two months ago—our staff concluded that its earlier request for civilian reactor funds should be supplemented.

The staff gave four reasons as to why it thought this increase was necessary.

The first reason was that the size of the task provided was larger than anticipated. That is an overall statement of our program.

The second thing they very definitely pointed out in their paper was that the timing and extent to which industry can be expected to participate financially will be later and probably less than originally anticipated.

Number three, information regarding programs of other nations furnish stronger incentives for accelerating our own program.

Number four, the staff has acquired a better appreciation than it originally had for the requirements of the countries we intend to help, indicating the need for increased attention to certain specific power reactor characteristics.

Now, following that up, and that was part of a staff paper, the staff then recommended that we submit a supplemental budget to the extent that research and development should be increased by fifty-five million dollars, and for construction they recommended an increase of thirty-five million dollars.

Now, those figures were approved by our own Commission.

In the budget, however, that is before you today, that you are going to ask to pass upon, those figures have been reduced from fifty-five million dollars for research and development, to fifteen million dollars, and for construction from thirty-five million dollars to fifteen million dollars.

In other words, this budget before you has been cut some sixty million dollars.

Now, I submit that we need more money, and our staff agreed in April that we did need more money, to carry on research and development in order to solve the problems of the Detroit Edison Company and other problems related thereto, in order to get on with a vigorous civilian power reactor program.

As a result, that program as submitted was reduced by sixty million dollars. I think that adds up to the suggestion that I have that I would like this committee, if it would in its own judgment, reestablish —nothing to do with building large reactors at the moment; nothing to do with an appropriation to build three or four, whatever the number of reactors you might want—I ask this committee to reestablish the research and development figures so as to include the original figures that were submitted in the supplemental budget.

I ask that at least sixty million dollars be put in just for that purpose and for construction.

Chairman CANNON. That would restore the original estimate submitted by the Commission.

Mr. THOMAS E. MURRAY. By our staff. And it will not solve all our problems, but it will go a long way to accelerate some of the problems that are being raised.

It will not solve the question that Detroit Edison is raising about insurance.

I assume that everybody agrees we will solve that.

It will not solve the question of the Holding Company Act, whether they are going ahead if they get relief from the Holding Company Act.

I am not in a position to make any comments on that.

Mr. TABER. The SEC made comments on it yesterday, indicating that an application to them would solve it.

Mr. THOMAS E. MURRAY. I hope it would. I think we must do anything we can do to accelerate their progress, to push along this reactor development program. It is just like you would do in insurance; it would be purely on a tentative basis. Under these circumstances and for this particular project these things, I believe, personally, ought to be granted to these companies.

HOLDING COMPANY ACT

There is a third item; they want exemption from income taxes. This is a reasonable request.

If a company like the Detroit Edison or some other public utility company decides to put in so much money in for research and development, I believe the request ought to be granted, but it ought to be limited to the particular project and not extended in any way to change what is now known as the Holding Company Act.

Chairman CANNON. In answer to the point just raised by Mr. Taber, the answer is that Detroit Edison has not applied, and they are not applying, and we have no indication at this time that they will apply.

Mr. THOMAS E. MURRAY. I do not know that. I have not followed that at all.

Chairman CANNON. I will ask the Chairman: Is that true?

Mr. STRAUSS. I have no information about it at all, Mr. Chairman. The statement has been made repeatedly that that was a hurdle which was going to be very difficult for the company to take.

I am delighted to learn that it is not a difficult hurdle at all. I have not understood that they were asking for any tax relief other than that applicable to the particular venture which this constitutes.

Chairman CANNON. I regret that the gentleman's information is so limited.

Chairman Armstrong of the SEC, told us yesterday they had not applied; there was no application now pending, no prospect it will be pending.

Mr. TABER. If they are going to proceed, they ought to apply.

Chairman CANNON. Instead of applying for it, they are coming to Congress for legislation; they are taking the long way around.

Mr. STRAUSS. I suspect the subsequent result will mean that the application will be prompt. But I am not a spokesman for the Detroit Edison Company.

Chairman CANNON. I might say for the information of the Chairman that they have applied for tax relief. They made it a condition precedent in their contract that they be accorded tax relief.

POWER DEMONSTRATION PROGRAM—LIMITATIONS

Mr. THOMAS E. MURRAY. You have in a paper listed before you what we call a first round and a second round of demonstration power reactors.

Under the second round, the budget before you today will probably only permit us to go ahead with two more of those in the second round.

Chairman CANNON. Two out of the seven?

Mr. THOMAS E. MURRAY. The commission has already approved two of these projects under the second round.

But I call your attention to the fact that we have not the money in our budget if, at some later date, we decide that all other five jobs are worthwhile going ahead with. To go ahead with all five now, we will be short some thirty million dollars.

In other words, our first round is covered; our second round is short some thirty million dollars, and I am conceiving of a third round. I think that this committee should be aware of that fact and should provide funds for the second round in case we decide to take the whole seven. We should have some additional money either to implement round one, or to implement round two, and then we might call for a third round.

Mr. PHILLIPS. You mean before we will know how much it will be?

Mr. THOMAS E. MURRAY. Well, there could be, Mr. Phillips, an amount set aside. We have had that done before.

I am giving you some preliminary estimates here of what we would need if we accepted everything under the second round proposals. We would be short some thirty million dollars.

Now, are we going to wait a whole year to come back before you again to get new appropriations for perhaps some new projects that we think are well worthwhile, to go under the same kind of formula or rules, in a third round? I don't think we should.

Mr. PHILLIPS. Would you not be back in January?

Mr. THOMAS E. MURRAY. The Congress, of course, will be back in January, but the action that may be taken on things of this sort might be May or June.

I only raise the point so that you recognize what the situation is in our present budget and the limitations in our present budget places on getting ahead with what we call the power demonstration program.

Mr. TABER. Could you tell us which one of these projects you would be——

Mr. THOMAS E. MURRAY. No, I answered before you finished your question.

Mr. TABER. Which ones have been approved and which you would proceed with, that you have not the funds to proceed with?

Mr. THOMAS E. MURRAY. The ones that have been approved are what is called the Elk River project and the Hersey, Michigan, aqueous reactor.

I think you will find that on chart XI (see p. 97). Those two projects have been approved and we think they have promise.

Now, the reactor development group today might stand up here—Mr. Davis might say that "I am going to throw out all of those other five". That decision has not been made.

But if it was made that we needed these other five, and it was in the interest of getting ahead with atomic power, we would not have the funds to do it.

HOLYOKE, MASS., REACTOR

Mr. BOLAND. To keep this in proper perspective, I want to get back again to the Holyoke, Massachusetts, gas cooled reactor.

I remember the other day I asked Mr. Davis the question relative to the request for funds for this particular project. I find none under the justification here under civilian reactors, but you did say that the Army was developing this particular reactor.

Is that true? They have money; they are going ahead with it?

Mr. DAVIS. This is done by the AEC, but by our Army power reactor branch.

Mr. BOLAND. Where does the money come from? Is the money appropriated to the AEC and they take care of the expenses of the Army power reactor branch?

Mr. DAVIS. Yes, that is part of our operation.

Mr. BOLAND. This is part of the regular Army power reactor, similar to the package reactor you are developing?

Mr. DAVIS. Yes, sir.

Mr. BOLAND. Is there any likelihood there will be any start on this particular reactor for 1961? It says that it is scheduled for operation in 1961. How close are you to developing something which is feasible in that particular field—in the gas reactor field?

Mr. DAVIS. I would not say that we had gone far enough to determine whether 1961 is a feasible date for the operation of a commercial gas turbine reactor. I think it is probably somewhat early.

Mr. BOLAND. Do you think it might be earlier?

Mr. DAVIS. I think that is an early date.

Mr. BOLAND. Do you need money in your program in this particular field?

Can we move along more rapidly if we give you money to work on this particular reactor, since this is one that you hope to get into operation in 1961?

Mr. DAVIS. Well, we have asked for funds under the Army power reactor program for this development work in fiscal 1957.

Mr. BOLAND. That is purely in research and development, is it not?

Mr. DAVIS. That is purely research and development.

Now, in the proposal made by Holyoke, they had asked for research and development assistance from the commission to the extent of three million, $3.7 million, which would then be in addition to what we had asked for under the Army power reactor program.

Mr. BOLAND. Do you think we ought to increase it to that extent, then?

Mr. DAVIS. This would not be in the current year in any case. I think the amount we have asked for for development this year is a reasonable amount for the very early stages of this development program.

Mr. BOLAND. Thank you.

Mr. THOMAS E. MURRAY. Mr. Boland, I call your attention to the fact that we originally had it in as a recommendation that we needed these funds to carry on the second round and the funds are not there now.

Mr. BOLAND. Who cut the funds? Where was the cut made?

Mr. THOMAS E. MURRAY. The Bureau of the Budget.

Mr. BOLAND. It was not made upon the recommendation of the AEC, then?

Mr. THOMAS E. MURRAY. No, sir; as far as I know, no.

Chairman CANNON. Does the Chairman agree with that?

Mr. STRAUSS. The statement is somewhat misleading. The staff of the Commission comes to the Commission with its requests in very much the same manner as the various Government agencies come before your committee. Almost invariably they request more money than the Commission finally approves as a budget to go to the Bureau of the Budget.

I think to cite a staff request for funds therefore is out of order in the sense that the Commission as a whole did not approve that particular paper, and I believe that the memorandum that Commissioner Murray has read from, although I do not have it before me, the particular memorandum that Mr. Murray read from was in fact revised by the staff, was it not, the wording was revised?

Mr. THOMAS E. MURRAY. The wording was revised, but not the amount.

Mr. STRAUSS. But you read the wording, I believe, in an original draft of it, Mr. Murray.

Mr. THOMAS E. MURRAY. I did, and this was the wording that was the best judgment of our staff, and we kept referring in this room all the time to what does the staff think and what is the opinion of the staff.

Mr. STRAUSS. The staff revised its wording.

GLOOMY INDEPENDENT INDUSTRIAL PROGRAM

Mr. THOMAS E. MURRAY. At the request of some of the members of the Commission, I believe their original reasons and particularly the reason that they give, namely, it appears doubtful that the timing and extent to which industry can be expected to participate financially will be later and probably less than anticipated. That is why I put in my statement before this committee and before the Joint Committee—to the effect that I believe the program that we are proceeding under on industrial economic power is looking more gloomy every day.

Mr. STRAUSS. The delays have taken place frequently right at the Commission table and I refer to the Yankee program that we finally approved and approved by majority vote and not by unanimous vote.

The delays are not attributable entirely to industry.

HOLYOKE PROPOSAL

Chairman CANNON. How much did you ask the Bureau of the Budget for the Holyoke, Massachusetts proposal?

Mr. FIELDS. Mr. Chairman, may I answer that question?

Chairman CANNON. Certainly.

Mr. FIELDS. The Commission asked for fifty-five million dollars and thirty-five million dollars, as Commissioner Murray indicated.

Mr. TABER. You mean they asked the Bureau of the Budget for that, the Commission did?

Mr. FIELDS. Yes.

Mr. TABER. What did the Budget give?

Mr. FIELDS. The Budget allowed fifteen million dollars each, fifteen million dollars in operating and fifteen million dollars in plant.

In the fiscal 1956 budget your committee of the Congress approved twenty-five million dollars in the plant budget for the power acceleration project—we have approximately seven million dollars of that which has still not been earmarked for any of these projects.

Mr. BOLAND. Repeat that, please.

Mr. FIELDS. We have seven million dollars from the plant appropriation that has not been earmarked specifically against any of these projects. The seven and the fifteen million dollars would give twenty-two million dollars of obligational authority in fiscal 1957. In the earmarking, we have earmarked funds against the construction side for the Consumers of Nebraska, for Elk River of Minnesota, and for Wolverine of Michigan. Funds have not yet been committed, but have been earmarked for those.

So we would have twenty-two million dollars left to apply against this second round if you appropriate the fifteen million dollars we have requested.

Chairman CANNON. Mr. Rabaut.

Mr. RABAUT. You asked for thirty-five million dollars?

Mr. FIELDS. And fifty-five million dollars on the operating side.

Mr. RABAUT. And you got fifteen million dollars?

Mr. FIELDS. In each case, yes.

Now, a large part of the request centered on our saying that we thought we might want a third round in the power demonstration program. We did not have too many specifics. We could not say definitely we were going ahead with a third round.

I believe their position was that if you want to go ahead with a third round, go ahead, but you can come in with a supplemental next year to cover it. I think that was their rationale. I don't know.

Mr. RABAUT. Whatever it was, it was not hurrying the deal any.

Mr. THOMAS E. MURRAY. I was.

Mr. RABAUT. Within the organization itself, how much money was requested by the Commission that they thought they needed?

You settled on fifty-five million dollars and thirty-five million dollars. How much did the organization request from you?

Mr. STRAUSS. What do you mean by organization?

Mr. RABAUT. Within your own organization. You do not grab this amount out of the sky. Somebody has to come to you and say "We need so much in this department".

Mr. STRAUSS. Mr. Davis, the head of the division, says the amount is the same.

Mr. RABAUT. Fifty-five million dollars and thirty-five million dollars?

Mr. STRAUSS. Yes.

Mr. THOMAS E. MURRAY. My position to be very accurate, was that I thought we ought to have another one hundred million dollars put in there in case we needed it.

Mr. RABAUT. You just suggested that sum?

Mr. THOMAS E. MURRAY. That is right.

Mr. TABER. How is such a suggestion justified in view of the situation that you have not yet gotten to the point of allocating the seven million dollars that is already available in 1956?

Mr. FIELDS. We have these proposals under review, sir.

Mr. TABER. And you are not ready yet to jump?

Mr. FIELDS. We are not yet ready to jump on them.

Mr. TABER. Have you any idea you will be more ready to jump in the coming year than you have been in this one?

Mr. FIELDS. Yes, sir. I would think by the end of this summer we shall have made our decisions on this second round as to what we are going ahead with and what we are not. Sometime in the next month or two.

Mr. TABER. Will you know by January?

Mr. STRAUSS. Mr. Chairman, we went to the Bureau of the Budget with a quite substantial supplemental, a large part of it for weapons, production and development.

Mr. RABAUT. When?

Mr. STRAUSS. Quite recently, before this came to you, and a part of it was indicated for this purpose.

Those items for which we could demonstrate an absolute firm need that would not wait until January 1957, the Bureau of the Budget allowed.

I had, I think, three meetings with the Director of the Budget on the subject and succeeded in getting approval of the larger part of the total amount that we had requested.

Mr. BOLAND. Mr. Chairman, may I ask this question?

Chairman CANNON. Mr. Boland.

Mr. BOLAND. The reduction in plant from thirty-five million dollars to fifteen million dollars—is that going to retard the progress of the Commission in developing reactors, is that going to retard the progress of the Commission in granting the licenses to the particular people who have applied for particular reactors?

For instance, a failure now in this budget not to provide $3.7 million—I take that example only to find out whether or not the failure to provide the $3.7 million in fiscal 1957 is going to retard the development of that reactor—will that mean that the Holyoke Gas and Electric Co. cannot put this on the line in 1961?

Mr. DAVIS. In my best estimate the reduction in this amount is not going to retard this in any specific way. We have tried to estimate what is required and have gone on the theory that if we make an additional invitation that we can probably get the money in plenty of time to enter into the negotiations.

You see, we have to give people several months to prepare proposals. It takes us some time, as has been evidenced, to try to work out the things to the point that we have something that we can go forward with and then we have to negotiate a contract.

That is a time consuming process, unfortunately, and will take, I am sure, until the next session of Congress for any new proposals that we might receive.

Mr. BOLAND. I appreciate that and I applaud the Commission for its activity in that field. I do not want the AEC to approve some reactor for a utility plant that is going to cost the consumers millions of dollars when it is not going to be too practical or feasible.

I think that is good judgment on the Commission's part.

Now, does the reduction from thirty-five million dollars to fifteen million dollars in fiscal 1957 for plant affect putting on the line any of the other reactors outside of the ones we have been discussing here?

If we gave you thirty-five million dollars, would we be able to move ahead more rapidly with this particular program?

Mr. DAVIS. Mr. Boland, our best estimate is that it will not affect it.

Mr. THOMAS E. MURRAY. Ask the question why was it recommended.

Mr. DAVIS. It was originally recommended because we felt if we went out for additional proposals we might want to have in hand the money to back these up in advance of making additional invitations.

Chairman CANNON. And if it was not needed how does it happen they are here on a supplemental estimate asking for the money?

Mr. BOLAND. He gave the answer I think.

Mr. DAVIS. I should point out we have asked for the money for really three different kinds of purposes. One of these is to allow us to go ahead with our own research and development work where such funds are required to accelerate and speed up the program.

The second reason is to allow us to go into the development of new kinds of reactors which might not have been a part of our program at the time we went through the budgetary process.

The third reason is to back up these power demonstration reactor programs themselves.

Now, a good part of this fifteen million dollars we have requested we feel is necessary for this research and development program.

We cannot say at the moment how this might be divided between the power demonstration reactor proposals and our own research and development programs, because we do not yet have any decision on the remaining five proposals.

We tried to make the best guess we could as to what a likely division would be here.

Mr. BOLAND. That is a very substantial cut, fifty-five million dollars to fifteen million dollars. That is a forty million dollar cut in research and development and a twenty million dollar cut in plants over the original request of the Atomic Energy Commission. You requested thirty-eight million dollars originally and came up with the supplemental and the staff decided that the time and extent in which the industry would participate is less than anticipated; is that the judgment of the Commission, too?

I mean the staff came up with this particular suggestion in the supplemental, fifty-five million dollars for research and development, and thirty-five million dollars for construction, and apparently the Commission must have gone along with the thinking of the staff because that is the figure that it requested of the Bureau of the Budget.

Now, it would seem to me, reducing the research and development from fifty-five million dollars to fifteen million dollars, is a real substantial cut in research and development for your Commission?

Mr. STRAUSS. It would be a substantial cut, sir, if the amount were needed for expenditure between now and January 1.

My understanding is that it is not needed, and I think Mr. Davis' testimony is to that effect.

Dates of Scheduled Operation Wholly Undependable

Chairman Cannon. Before we resume with the testimony of Commissioner Murray, I would like to ask Chairman Strauss:

You concede that the date of 1961 for the Holyoke, Massachusetts reactor has no basis in fact, and that there is no indication as to when you can expect action?

Mr. Strauss. As Mr. Davis just testified, it may be an optimistic date.

Chairman Cannon. That means that the entire list you have given us from 1959 on down in chart XI is undependable? Chart XI, printed before at page 97, represents your program.

Mr. Strauss. No, sir; I do not think that is a fair inference.

You asked a question about one project and you applied the answer to them all. There are different degrees of certainty with respect to the various dates. If you would like to have them discussed individually——

Chairman Cannon. Naturally if you gave us a definite date on one proposition and we found it was not dependable, we would be rather suspicious of the other dates.

Mr. Strauss. It was not offered as a definite date, Mr. Chairman.

Chairman Cannon. You have printed here in your power demonstration program (chart XI, p. 97). You said "Scheduled for operation" and you say "Holyoke, Massachusetts, 1961."

You have submitted a schedule on which we should be able to depend and we find it not dependable.

Mr. Strauss. I must take exception to the inference. This is the statement of the City of Holyoke authorities as to their estimate of the date of the completion of the plant.

The Commission is not constructing the plant and can take no responsibility for the date, nor I for repeating it to you.

Chairman Cannon. Holyoke has no control over it. It rests with the Commission. The Commission has told us and has given us a printed statement here that it is scheduled for operation in 1961 and we find that does not mean a thing in the world.

Mr. Phillips. Mr. Chairman, do you have any recollection as to when we scheduled the end of the appropriations hearings for this year?

Chairman Cannon. These hearings are always subject to the exigencies of the occasion.

Mr. Phillips. Would this not apply here?

Chairman Cannon. Here is a business organization dealing with one of the most essential things that can be brought before us—date of completion—and it prints in its statement that these facilities will be in operation in the period between 1959 and 1962.

As Mr. Boland has developed——

Mr. Strauss. Mr. Chairman, Mr. Boland has developed, and you have heard statements to the effect, that this reactor has not even yet been developed.

Chairman Cannon. Then why do you say it will be in operation in 1961?

Mr. Strauss. I have not said so.

Chairman Cannon. You have said so in this printed schedule right here before us.

Mr. Strauss. It has been testified to, quite recently, within a matter of minutes, that this is the date upon which it is scheduled

for operation and that we have taken the position that that date is too optimistic.

How much more can we say?

Mr. RABAUT. If we had not brought up this subject we would still be laboring under the idea that this is the date of scheduled operation.

Mr. STRAUSS. It is the date of schedule for operation as supplied to us by the City of Holyoke.

Mr. RABAUT. But the City of Holyoke does not supply it to us. The Commission brings us this paper and supplies it to us.

Mr. STRAUSS. That is right.

Mr. RABAUT. That is the reason. If this subject did not come up here for argument we would walk out of this room thinking this was the date it was coming in and we might make public announcements throughout the country to that effect.

Mr. STRAUSS. I fail to see the materiality of an estimated date for a reactor that does not exist, to be erected by others than the federal government.

Chairman CANNON. If this one date is not dependable, it throws suspicion on everything else in this program.

Mr. STRAUSS. Mr. Chairman, that is matter for which I have no cure.

GOVERNMENT CONSTRUCTION OF ATOMIC POWER PLANTS

Chairman CANNON. Continuing the testimony of Commissioner Murray, will you give some information about the bill which is now being prepared and is expected to be reported out shortly by the Joint Committee, providing for three large and several small reactors?

Mr. THOMAS E. MURRAY. I would be very reluctant to tell you what that bill is.

Chairman CANNON. You do not think there is anything that should be concealed from this committee, do you?

Mr. THOMAS E. MURRAY. No. I can give you some highlights in the thing.

Chairman CANNON. If you will.

Mr. TABER. If that bill is printed, what we need on that is copies.

Chairman CANNON. We would like to have the gentleman's comment on the bill. We are more interested in his comments on the bill than the copies of the bill.

Mr. PHILLIPS. The difficulty is that I have not seen the bill and I really would not know what Mr. Murray would be talking about if he said it.

Could we not have copies of the bill?

Chairman CANNON. The gentleman can be supplied; it is in the document room.

Mr. PHILLIPS. I request that I be supplied with one before Mr. Murray testifies.

Chairman CANNON. You can send for one.

Mr. PHILLIPS. Will the Chairman be kind enough to send one of his clerks for a copy of this bill for the minority? You had better get it from the Joint Committee.

Mr. THOMAS E. MURRAY. Mr. Chairman, I have no idea of what eventually came out of the committee hearing this morning.

Chairman CANNON. Hearings are now in progress.

Mr. THOMAS E. MURRAY. If I was to summarize what they wanted us to do, it would be something like this:

They asked us to build three large reactors at production sites. They also asked us to do what we could—I could not understand this completely last night, to aid in building reactors abroad.

What I did get out of the bill and what I think may impress you, and I don't know whether it is still there, is that they were going to suggest that four hundred million dollars be appropriated for this purpose.

Mr. PHILLIPS. Mr. Chairman, I would not like to interrupt you, but I have an official report saying that the Joint Committee has just reported out that bill and that it is not yet in print. So I think we are all in difficulty.

Chairman CANNON. On that account the report of the Commissions before them yesterday will be all the more in point.

You may proceed.

Mr. THOMAS E. MURRAY. I think I have covered what I got out of the bill.

With all due respect to Mr. Phillips, I don't know what was in the bill. I could not interpret the bill for you.

Mr. PHILLIPS. We are all in the same boat. We are discussing something now about which none of us knows.

Chairman CANNON. You may proceed.

Mr. THOMAS E. MURRAY. What I got out of the bill was that this would in effect change national policy in regard to the development of large power reactors. That is number one. Two, we would construct large reactors at production sites with Federal funds. Also that we would do our best, or some such language, to develop small reactors to be placed abroad.

Then I end up with the idea that the figure, I suppose that looms greatest in my mind, is the four hundred million dollars which they put in there that would be necessary to carry on such a program.

Mr. PHILLIPS. As I understand it, this committee has not yet been asked for any money for that?

Mr. THOMAS E. MURRAY. No.

Mr. PHILLIPS. Would you say there is anything in the bill which was intentionally or unintentionally an attempt to move the Congress into the nationalization of atomic power?

Mr. THOMAS E. MURRAY. None whatever. I don't think so.

Mr. TABER. For what else would they be striving to have all these big setups built by the government and thrown at us in that way? So that they could have authority established to sell power at less than cost and get us deeper and deeper into debt?

Mr. THOMAS E. MURRAY. Mr. Taber, I made a suggestion 2 weeks ago, in order to avoid the thing you are saying. I suggested that these reactors be placed at our production sites where today we are using about seven million kilowatts of electricity.

Mr. PHILLIPS. If I may ask the same question I asked Mr. Rickover and which I had on my list to ask the Commission, if we went into a program of developing smaller reactors at our own sites, then would not this be the situation, we would be getting our knowledge on small rather than on large reactors when actually what we need is information at the moment on the larger reactor?

Mr. THOMAS E. MURRAY. Yes.

Mr. RABAUT. That is why you are building four. You are building four large ones?

Mr. PHILLIPS. I am not sure what is in the Senate bill.

Mr. RABAUT. From the information given us they are going to build four large ones.

Mr. THOMAS E. MURRAY. Three.

Mr. RABAUT. Shippingport makes four.

Mr. PHILLIPS. The Chairman has announced we should not take at face value anything that the Commission says because it is apt not to be correct. I want to see the bill.

Now, my second question is, if we build these at our plants instead of wherever private industry might build them, then have we actually put them where there will be the need for the power as compared to a great city?

That troubles me and I am serious about that.

Mr. THOMAS E. MURRAY. I cannot give you the reason——

Mr. RABAUT. Did you say they were putting them at a place where they have a demand for electrical power now?

Mr. THOMAS E. MURRAY. Yes, seven million kilowatts.

Mr. STRAUSS. That was not the bill. The bill, as originally shown to the Commission, required at least one of the plants to be built in a high cost, high power cost area, with no qualifications at all with respect to its location adjacent to a Commission facility.

Mr. TABER. If we are going to get to that meeting at two o'clock, we ought to be adjourning pretty quickly.

Chairman CANNON. We still have one or two vital matters. I am certain the gentleman would rather run a little longer today than come back next week.

Mr. TABER. I think we have considerable time ahead of us if we are going to get through with this. I think at least two hours.

Chairman CANNON. May I say to the Commissioner that your testimony develops two elements of surprise.

DETROIT EDISON FAST BREEDER DESIGN FOUND UNSAFE BY AEC

The first is the hazard, the danger, and you say that the danger is so great that the Commission has rejected the designs by Detroit Edison.

Mr. THOMAS E. MURRAY. The designs that the Detroit Edison Company has submitted to our Reactor Safeguard Committee are not satisfactory and have been turned down as of June 6.

Chairman CANNON. They were rejected June 6?

Mr. THOMAS E. MURRAY. I mean they were not approved.

Mr. STRAUSS. The Commission has taken no action.

Mr. THOMAS E. MURRAY. The Commission has taken no action on this.

Chairman CANNON. But up to this time they have not been approved.

Mr. THOMAS E. MURRAY. That is right.

Chairman CANNON. And you have had from June 6 down to June 27 and they have not yet been approved by any agency or by the Commission itself.

Let me ask this: We discussed yesterday in exhaustive detail the roadblocks and bottlenecks in the negotiations in order to get Detroit Edison into construction of this fast breeder reactor.

Here is another cause for delay and it was not mentioned to us. I cannot understand why it was not mentioned to the committee when we were discussing these other causes for delay.

Furthermore, we discussed yesterday the danger connected with the possibility of these plants getting out of control.

We discussed that in detail and still we were not told that was the cause for failure to approve designs of this plant that we are so anxious to get along with.

Why was this not mentioned to us, Mr. Chairman?

Mr. STRAUSS. It was. It was stated that this fast breeder was the most hazardous of all the reactors.

Chairman CANNON. The gentleman did not mention that there had been no approval of the design on that account. That was not told us. That was the center of the matter.

Mr. STRAUSS. We were trying to make our answers responsive to the question. I cannot recall a question whether this design was or was not approved.

Chairman CANNON. We would like you to give us some information.

Mr. STRAUSS. Then, I would like to give you some information.

Chairman CANNON. I think at this time when the matter is of critical importance to the nation and when we are trying to accelerate progress, here you have delayed and are still delaying approval and did not mention it to us.

Mr. STRAUSS. Mr. Chairman, we are not delaying approval. The Commission has had no opportunity to conduct any business for the last week.

Chairman CANNON. You had from June 6 and, of course, you had a long time in advance of June 6, because your subcommittee previously considered it. Commissioner Murray.

Mr. THOMAS E. MURRAY. I have no idea.

Chairman CANNON. You had this under consideration for some time?

Mr. THOMAS E. MURRAY. All of these designs are submitted, before approval, to our Reactor Safeguard Committee and a permit for construction and go ahead is not given until the committee approves.

Chairman CANNON. You say it has not been approved and no action has been taken.

Mr. STRAUSS. That is not so. Since the receipt of that letter the proper officers of the Commission have had meetings with the Reactor Safeguard Committee and with the other people who are cognizant and competent on the question.

A very short time has elapsed since the Commission has received that letter and I should like to complete an answer——

Chairman CANNON. You say a very short time. Let me remind you it was between June 6, and June 25.

You can make your own conclusions.

Mr. STRAUSS. Since June 25, sir, we have been practically in continuous session with you.

May I complete one other answer, sir?

Chairman CANNON. Proceed.

Mr. STRAUSS. You were a few moments ago, I think, critical of the statement that had been made in a table submitted to you in which the date of the estimated scheduled operation of the Holyoke——

Chairman CANNON. That is outside of this proposition.

We have finished discussion of that point.

Mr. STRAUSS. But you have cut me off, Mr. Chairman, from answering questions and I cannot answer questions unless I answer them in extenso.

Chairman CANNON. You had every opportunity to answer.

Mr. STRAUSS. Not completely.

Chairman CANNON. We will hear you now.

Mr. STRAUSS. If you will continue to read from the paper which you have before you, at the bottom of that column you will see the words "Based on proposals submitted to the AEC".

I want to call those words to your attention because they indicate the derivation of the information and clearly do not indicate that these are representations made "by" the Atomic Energy Commission.

Chairman CANNON. It is our understanding, Admiral Strauss, that you had up to this time been provided with ample funds to carry out all your plans, and in the beginning we assured you that if you would supply the program we would supply the money.

But you have never told us that this sixty million dollars was cut out of your recommendation.

That is a vital matter.

Mr. TABER. The gentleman was not asked and it would be against the law for him to suggest that.

Mr. STRAUSS. This whole business of government would be in a fine condition if the Bureau of the Budget, which was established by Act of Congress, was thwarted in its purpose by testimony by the various agencies going beyond the understandings that they have with the Bureau. That is one of the very functions which the Bureau was set up by Congress to prevent.

Mr. PHILLIPS. Mr. Chairman, I have been advised that we are facing a roll call on the floor on that construction bill. Do you know about that? And that we are coming back here at two o'clock. You have opened up a subject now which I presume will take some time.

This side knows that it is going to consume an hour or more, especially with what has just been opened up in the last fifteen minutes.

I think, Mr. Chairman, the only fair thing to do is to adjourn this meeting and adjourn it over to the nearest possible time. I am just as anxious as you to get through with it.

Chairman CANNON. Mr. Taber, when would it be a convenient time for you to resume?

Mr. TABER. We have the markup on that foreign relief on Monday morning at ten o'clock. If we get through that during the day that would be about the best we could hope.

I would say Tuesday morning at ten would be about the best we could plan.

Chairman CANNON. In response to the suggestion of the gentleman from California, we will adjourn at this time and in response to the suggestion of the gentleman from New York, we will resume testimony from the Atomic Energy Commission at ten o'clock Tuesday morning.

The committee is adjourned.

FRIDAY, JUNE 29, 1956.

ELECTRIC COMPANIES' ADVERTISING PROGRAM

WITNESSES

EDWARD R. DUNNING, VICE PRESIDENT, N. W. AYER AND SON, INC.
DWIGHT C. VAN METER, ASSOCIATE
FRANCIS H. SCHEETZ, COUNSEL FOR N. W. AYER AND SON, INC.

Chairman CANNON. The Committee will come to order.

We have before us this afternoon Mr. Edward R. Dunning. Will you please come forward, Mr. Dunning?

Mr. DUNNING. Yes, sir.

Chairman CANNON. Mr. Edward R. Dunning appears this afternoon in response to the invitation of the Committee to testify on matters relating to the Atomic Energy program.

Mr. James C. MURRAY (presiding). Mr. Dunning, will you kindly identify yourself for the record, and also identify anybody here with you who might participate in the questioning?

Mr. DUNNING. Thank you, Mr. Murray and Mr. Chairman.

On my left is Mr. Francis H. Scheetz of our law firm from Philadelphia. In back of me is Dwight Van Meter, my closest associate in N. W. Ayer and Son. We together work on this account.

I would like to have the privilege, if I may, Mr. Chairman, of reading a short explanatory note as to my job and what I do.

Mr. James C. MURRAY. Proceed, Sir.

STATEMENT OF EDWARD R. DUNNING

Mr. DUNNING. My name is Edward R. Dunning, Vice President of N. W. Ayer and Son, Inc. I appear before this Committee because of a telephone request from your counsel, Mr. Donnelly, without subpoena. No subpoena is needed to get me here and none is required as a reason for my being here.

It is my understanding that the Committee is interested in the advertisement entitled: "How America Will Keep Its Lead in Atomic-Electric Power" which we prepared and placed for our client, a group of companies known as: "America's Independent Electric Light and Power Companies." The names of the 120 companies in the group are available to the Committee, if desired. We placed this advertisement in 37 newspapers in 21 cities on June 13, 14, and 15, and some of the companies used it in other publications beyond these 37.

First, I want to point out our policy and concern for every advertisement we prepare. Our function as an advertising firm is to counsel with and assist our clients in the application of advertising to their businesses. This embraces advice on the proper use of advertising and preparation thereof, selection of the media, and placement of the message. Advertising is a technique for mass communication with a unique blend of four characteristics—low cost, speed, control and responsibility. Ayer is concerned with these four factors as a matter of policy.

N. W. Ayer and Son has been in the advertising business for 87 years. It is the oldest advertising agency. I am not necessarily the oldest employee. I may look it, but I am not. It is a fairly responsible organization, maybe leaving me out of it. Other than

that it is pretty responsible. We are highly departmentalized and highly specialized. We have been serving this particular client for 15 years.

It is my job to bring the varied facilities of our organization to the group of electric companies who signed this particular advertisement. I shall be glad to answer to the best of my ability any questions the Committee may have regarding the advertisement.

Thank you very much.

ADVERTISEMENT ON JUNE 13, 1956

Mr. JAMES C. MURRAY. Mr. Dunning, just for the purpose of the record I think we ought to include here at this point in the record following your statement, the advertisement which you referred to in your testimony and about which the questions will revolve. I have a copy here. Is that the ad (exhibiting advertisement).

Mr. DUNNING. That is the advertisement.

Mr. JAMES C. MURRAY. I will now ask unanimous consent that that be included at this portion in the record.

Mr. PHILLIPS. Does that indicate the source? Is that the Washington Star?

Mr. JAMES C. MURRAY. That is the entire advertisement as it appeared on June 13, 1956, in the Evening Star, Washington, D. C. (And as Mr. Dunning has just testified, it appeared in 36 other newspapers in 21 cities.)

(The advertisement is as follows:)

HOW AMERICA WILL KEEP ITS LEAD IN ATOMIC-ELECTRIC POWER

This is the way nations rate in nuclear reactors built or planned

[All types and for all purposes]

	Completed as of 1956	Building or planned
U. S. A.	55	35
Great Britain	7	23
Russia	6	11
All others	10	14

In the past few months, the question has been raised, "Is America behind in the development of atomic-electric power?" The full facts answer "No." And America's electric light and power industry, in full cooperation with other organizations in this country engaged in atomic research and development, will do its part to make sure the answer remains "No."

At the present time, for instance, the Atomic Energy Commission, the electric companies and various other organizations have built, or are building or planning, more nuclear reactors than all other nations combined. More in number and scope—90, representing many reactor designs. And more promising for the future—for every reactor today is largely experimental, built to provide research in and knowledge of a whole new science and a new technology.

ELECTRICITY FROM THE ATOM

Much of this research and knowledge has a direct bearing on one of the atom's greatest promises, the production of electric power. Far more experimentation will be required to prove which of the many types of reactors are most efficient, most workable and most economical. But we are well on the way to finding out.

Foremost in this experimentation is the basic and comprehensive reactor research program led and carried on by the Atomic Energy Commission. This research puts theories to the test, discovers how to design and build various types of reactors, uncovers basic problems and possibilities, and provides the vital first

tries that are necessary before larger and better reactors can be designed and built. Already, these tests are separating the most promising from the least.

THE NEXT STEP

From this basic research—some of which is also being done by America's independent electric companies—the next step is big, full-size commercial atomic-electric plants. That step is being taken, too. The electric light and power companies already have 7 of these large atomic-electric plants on the way or under study. They, too, are experimental as far as their reactors go—for they include a number of different kinds of reactors and various designs. Until they provide operating experience, no one will know which types are most useful for further development.

The problem of producing electricity from the atom was solved long ago. But so long as we have adequate supplies of coal, oil and gas that can produce low-price electricity, it would be wasteful for America to build large numbers of atomic-electric power plants which could produce electricity only at high cost. Our objectives should be economy and efficiency in reactor design and construction, without passing up any promising designs in our search. Progress toward this objective is being made.

ELECTRIC COMPANIES BUILD

More than 300 million dollars from individual investors is involved in the planning and construction of atomic-electric plants and related research. A total of 44 electric companies is participating in building these reactor plants. In so doing, they are drawing on their industry's 75-year experience in producing electricity from other fuels.

To speed this program still further, America's independent electric companies are forming a special task force on atomic-electric reactors. The function and nature of this new group is described in the box below.

STILL IN TESTING STAGE

Because the U. S. today has plenty of electric power and plenty of conventional fuels, the wise program is to test many reactors, types and designs and select the best. It will help assure our continuing lead in atomic development over countries which are building atomic-electric plants with today's limited knowledge because they so desperately need electricity at any price.

Information like this about our nation's atomic-electric power program is important to you and others interested in the welfare of their country. It is important to you as a citizen and as an electric customer. Because this is so, reports of progress in atomic-electric power will be brought to you from time to time by *America's Independent Electric Light and Power Companies**.

WHERE DO WE GO FROM HERE?

Atomic-electric power is in its infancy. So varied are its possibilities that special measures must be taken to see that none of the atom's promises will be overlooked.

To make sure of this, America's electric light and power companies are forming a technical appraisal task force to evaluate and stimulate research, development and construction that will advance the promise of economical and practical electric power. This task force will be composed of some of the nation's leading nuclear engineers and scientists, as well as leaders in the electric industry.

The findings of this task force, as well as all other experience and knowledge of America's power companies in the field of nuclear reactors, will be shared with any group dedicated to the objective of maintaining American leadership in atomic-electric power.

(NOTE: End of advertisement.)

76—68-1956—1 page, b. & w.—15 3-16 ins. x 286 lines—N. Y. Herald Tribune, N. Y. Times, Washington Post Times Herald, Washington Star, Cleveland Plain Dealer, Detroit News, Detroit Free Press, Chicago Tribune, St. Louis Globe Democrat, St. Louis Post Dispatch, Minneapolis Star, Minneapolis Tribune, St. Paul Dispatch, St. Paul Pioneer Press, Denver Post, Christian Science Monitor, Wall Street Journal, San Francisco Examiner, Oakland Tribune, Los Angeles Times, Boston Herald, Boston Traveler, New Orleans Times Picayune, New Orleans States, Dallas News, Atlanta Constitution, Atlanta Journal, Des Moines Register, Des Moines Tribune, Seattle Times, Kansas City Times, Kansas City Star, Phila. Bulletin, Philadephia Inquirer—all daily insert, June 12—N. W. Ayer & Son, Inc.

**Names on request from this newspaper.*

Mr. JENSEN. Mr. Chairman, may I ask this question: Has every member of the committee present read this advertisement? If not, I would suggest—I would make it a request—that the clerk read the complete advertisement: Would there be any objection to that?

Mr. RABAUT. What is that, Mr. Jensen?

Mr. JENSEN. I am asking if every Member present has read this advertisement.

Mr. RABAUT. Every Member present has a copy of it.

Mr. JENSEN. Have they read every word of it?

Mr. JAMES C. MURRAY. Every Member has a copy, Mr. Jensen.

Mr. JENSEN. The reason I make that request is that I want every Member to know, and I think it is proper that they should know, exactly what we are discussing, to determine in their own minds the weight and the purpose of this advertisement. If every Member has read it then there would be no point in having it reread. I have read it very carefully.

Mr. PHILLIPS. May I also ask, as a matter of information: I take for granted, Mr. Murray, that your interrogation is confined to this advertisement?

Mr. JAMES C. MURRAY. I am going to attempt to confine my interrogation to this advertisement; that is correct. Some of the questions I might ask might go beyond the advertisement, but they are merely to lay a foundation for the advertisement.

Mr. JENSEN. Are we to understand now that every Member present, every Member of this sub-Committee, has read the complete advertisement? If no one answers to the contrary then we will consider that every Member has read the advertisement.

RIGHT TO ADVERTISE RESPECTED

Mr. JAMES C. MURRAY. Now, Mr. Dunning, I want you to understand that everybody on the Committee and certainly myself respect your right to express publicly any opinion that you hold. Our purpose of inquiry is not an attempt to question your right to express your opinion in whatever way you want to express it, about any subject on which you want to express it, and particularly about the subject to which the advertisement appertains. That not only applies to you but also to the members of your staff and your clients.

The purpose of our inquiry is a desire to get the purported facts which appear in your newspaper publication which are important to the Committee's determination of the atomic energy program and which appear contrary to the facts which were presented to the Committee.

I would also like to put you at ease, Mr. Dunning, and I would also like to suggest to you that there is no suggestion whatsoever of any impropriety by you, by any of your clients, or by any of your employees.

Mr. DUNNING. Thank you, sir.

Mr. JAMES C. MURRAY. It is merely an inquiry into facts which we feel will be helpful to the Committee in the determination of a subject which we know you feel is a subject very important to the interests of the American people.

Purpose of Advertisement

The first question I have is this: Is this advertisement designed to give the impression that the present atomic energy program is sufficient to enable America to keep the lead in the development of atomic power?

Mr. Dunning. Yes, it does.

cost of advertisement

Mr. James C. Murray. Now, how much was the total cost of running this advertisement, including the advertising agency costs as well as the payment to newspapers, if we are not going into the realm of confidential information?

Mr. Dunning. No confidence there. The cost of the space was $73,605.78. The estimated preparation cost of the ad, composition and all, is $1,000. A total of $74,605, definitely less than $75,000.

Mr. James C. Murray. Would you say, then, that that $75,000 was the total cost for placing this ad in the various places that it was placed?

Mr. Dunning. Mr. Murray, let us be straight on that. That covers the 37 newspapers that we placed it in. Many companies reprinted the advertisement at their own expense in many other newspapers; maybe a dozen in Ohio, two or three in Florida, three in Oklahoma that I happen to know about.

Mr. James C. Murray. Do you have any idea of the total cost of that, or would that be something outside your knowledge?

Mr. Dunning. I have no knowledge of that, sir. That is an expense of the individual company in which we do not participate.

Firms Sponsoring the Advertisement

Mr. James C. Murray. Would you place in the record at this point the names of the clients who asked you to have this inserted in the various newspapers, and the names of the newspapers in which it was inserted, that you have knowledge of?

(Note: The names of the newspapers in which the advertisement was directly placed by N. W. Ayer & Son, Inc., appear at the bottom of the ad which is printed above at page 243. The names of the other newspapers in which the ad was reprinted by participants in the advertising program whose names are contained in the following list are not available, nor is available the cost of such reprinting:)

May, 1956.

List of Participants

ELECTRIC COMPANIES ADVERTISING PROGRAM

Alabama Power Company, Birmingham, Alabama
Arizona Public Service Company, Phoenix, Arizona
Arkansas Missouri Power Company, Blytheville, Arkansas
Arkansas Power & Light Company, Little Rock, Arkansas
Baltimore Gas & Electric Company, Baltimore, Maryland
Blackstone Valley Gas & Electric Co., Pawtucket, Rhode Island
Boston Edison Company, Boston, Massachusetts
Brockton Edison Company, Brockton, Massachusetts
Cambridge Electric Light Company, Cambridge, Massachusetts
Carolina Power & Light Company, Raleigh, North Carolina
Central Hudson Gas & Electric Corp., Poughkeepsie, New York
Central Illinois Electric & Gas Co., Rockford, Illinois
Central Illinois Light Company, Peoria, Illinois

Central Illinois Public Service Company, Springfield, Illinois
The Central Kansas Power Company, Abilene, Kansas
Central Louisiana Electric Company, Inc., Lafayette, Louisiana
Central Power & Light Company, Corpus Christi, Texas
Cleveland Electric Illuminating Company, Cleveland, Ohio
The Connecticut Light & Power Company, Hartford, Connecticut
The Connecticut Power Company, Hartford, Connecticut
Conowingo Power Company, Elkton, Maryland
Consumers Power Company, Jackson, Michigan
Dallas Power & Light Company, Dallas, Texas
The Dayton Power & Light Company, Dayton, Ohio
Delaware Power & Light Company, Wilmington, Delaware
The Detroit Edison Company, Detroit, Michigan
Duquesne Light Company, Pittsburgh, Pennsylvania
Edison Sault Electric Company, Sault Ste. Marie, Michigan
El Paso Electric Company, El Paso, Texas
Empire District Electric Company, Joplin, Missouri
Fitchburg Gas & Electric Light Company, Fitchburg, Massachusetts
Florida Power & Light Company, Miami, Florida
Georgia Power Company, Atlanta, Georgia
Gulf Power Company, Pensacola, Florida
Gulf States Utilities Company, Beaumont, Texas
The Hartford Electric Light Company, Hartford, Connecticut
Holyoke Water Power Company, Holyoke, Massachusetts
The Housatonic Public Service Company, Derby, Connecticut
Houston Lighting & Power Company, Houston, Texas
Idaho Power Company, Boise, Idaho
Indianapolis Power & Light Company, Indianapolis, Indiana
Interstate Light & Power Company, Plattesville, Wisconsin
Interstate Power Company, Dubuque, Iowa
Iowa Electric Light & Power Company, Cedar Rapids, Iowa
Iowa Public Service Company, Sioux City, Iowa
Jersey Central Power & Light Company, Asbury Park, New Jersey
Kansas City Power & Light Company, Kansas City, Missouri
Kansas Gas & Electric Company, Wichita, Kansas
The Kansas Power & Light Company, Topeka, Kansas
Lake Superior District Power Company, Ashland, Wisconsin
Lawrence Electric Company, Lawrence, Massachusetts
Louisiana Power & Light Company, New Orleans, Louisiana
The Lowell Electric Light Corporation, Lowell, Massachusetts
Lynn Gas & Electric Company, Lynn, Massachusetts
Madison Gas & Electric Company, Madison, Wisconsin
Marietta Electric Company, Marietta, Ohio
Metropolitan Edison Company, Reading, Pennsylvania
Minnesota Power & Light Company, Duluth, Minnesota
Mississippi Power Company, Gulfport, Mississippi
Mississippi Power & Light Company, Jackson, Mississippi
Mississippi Valley Public Service Co., Winona, Minnesota
Missouri Edison Company, Louisiana, Missouri
Missouri Power & Light Company, Jefferson City, Missouri
Monongahela Power Company, Fairmont, West Virginia
The Montana Power Company, Butte, Montana
Monterey Utilities Corporation, Monterey, Virginia
The Narragansett Electric Company, Providence, Rhode Island
New Jersey Power & Light Company, Dover, New Jersey
New Orleans Public Service Inc., New Orleans, Louisiana
New York State Electric & Gas Corporation, Binghamton, New York
Niagara Mohawk Power Corporation, Syracuse, New York
Northern Pennsylvania Power Company, Towanda, Pennsylvania
Northern States Power Co. of Wisconsin, Eau Claire, Wisconsin
Northern States Power Co. of Minnesota, Minneapplis, Minnesota
Northern Virginia Power Company, Winchester, Virginia
Ohio Edison Company, Akron, Ohio
Oklahoma Gas & Electric Company, Oklahoma City, Oklahoma
The Orange & Rockland Electric Company, Monroe, New York
Pacific Gas & Electric Company, San Francisco, California
Pacific Power & Light Company, Portland, Oregon
Pennsylvania Electric Company, Johnstown, Pennsylvania
Pennsylvania Power Company, New Castle, Pennsylvania
Pennsylvania Power & Light Company, Allentown, Pennsylvania

Philadelphia Electric Company, Philadelphia, Pennsylvania
The Potomac Edison Company, Hagerstown, Maryland
Potomac Electric Power Company, Washington, D. C.
Potomac Light & Power Company, Martinsburg, West Virginia
Public Service Co. of Indiana, Inc., Indianapolis, Indiana
Puget Sound Power & Light Company, Seattle, Washington
Rochester Gas & Electric Corporation, Rochester, New York
Rockland Electric Company, Closter, New Jersey
Rockland Light & Power Company, Nyack, New York
Round Valley Light & Power Company, Springerville, Arizona
St. Croix Falls Wisconsin Improvement Company, Minneapolis, Minnesota
Savannah Electric & Power Company, Savannah, Georgia
South Carolina Electric & Gas Company, Columbia, South Carolina
South Penn Power Company, Waynesboro, Pennsylvania
Southern Indiana Gas & Electric Co., Evansville, Indiana
Southwestern Gas & Electric Company, Shreveport, Louisiana
Southwestern Public Service Company, Amarillo, Texas
Suburban Electric Company, Malden, Massachusetts
Superior Water, Light & Power Company, Superior, Wisconsin
Tampa Electric Company, Tampa, Florida
Texas Electric Service Company, Fort Worth, Texas
Texas Power & Light Company, Dallas, Texas
The Toledo Edison Company, Toledo, Ohio
Union Electric Company of Missouri, St. Louis, Missouri
The United Illuminating Company, New Haven, Connecticut
Utah Power & Light Company, Salt Lake City, Utah.
Virginia Electric & Power Company, Richmond, Virginia
The Washington Water Power Company, Spokane, Washington
West Maryland Power Company, Oakland, Maryland
West Penn Power Company, Greensburg, Pennsylvania
West Texas Utilities Company, Abilene, Texas
Western Massachusetts Electric Company, Greenfield, Massachusetts
Wisconsin Electric Power Company Milwaukee, Wisconsin
Wisconsin Michigan Power Company, Appleton, Wisconsin
Wisconsin Power & Light Company, Madison, Wisconsin
Wisconsin Public Service Corporation, Milwaukee, Wisconsin
Worcester County Electric Company, Worcester, Massachusetts

Mr. JAMES C. MURRAY. I will yield to Mr. Phillips.

Mr. PHILLIPS. Mr. Murray, I came to the conclusion I was going to ask something I could ask just as well later, and I will not interrupt your line of thought.

Mr. JAMES C. MURRAY. You can supply those later, Mr. Dunning.

Mr. DUNNING. That is the list of companies that sponsored the advertisement and the list of newspapers. Is that what you wish, Mr. Murray?

Mr. JAMES C. MURRAY. That is correct, sir. If you would hand it to the counsel it would be fine.

Mr. DUNNING. I will be glad to, sir. It is 120 companies.

Mr. JAMES C. MURRAY. That is correct. That is what was in your original statement.

FUTURE ADVERTISING PLANS

Is there any plan for continuing this line of advertisement; and, if there is, how often will you continue it and what will the total price be?

Mr. DUNNING. I cannot answer the latter part of your question. I am happy to answer the first, because if you read the ad it says:

* * * reports of progress in atomic-electric power will be brought to you from time to time * * *

Mr. JAMES C. MURRAY. Is there any plan within your knowledge of, say, periodically—once a month, or next month, or in 6 months—advertising along the line of the original ad? Is there any plan for an advertising program you know of?

Mr. DUNNING. There is no program set up, because developments in this art are coming pretty fast and furiously.

When this committee—the formation of which is announced in this ad—is appointed, I hope we will run a similar ad or an ad of the same importance, showing still further progress by the companies.

Mr. JAMES C. MURRAY. I see. So then the correct statement is that there is an advertising program that contemplates additional advertisements but there is no present plan to run, say, a next ad or the one after that, other than it is in the state of contemplation; is that correct?

Mr. DUNNING. To a degree, Mr. Murray. I must refer you to the fact that this is part of the electric companies' advertising program we have been running for 15 years. This is one segment of it. Whether we will run another newspaper ad—I expect we will, but I am not sure, because it is not scheduled or written. We do run in a list of 31 magazines on other things necessarily than atomic power, but sometimes including atomic power.

Mr. JAMES C. MURRAY. But you do have now a definite program for advertisement in connection with atomic electric power?

Mr. DUNNING. We have no definite program, sir. As I say, I hope we will run another advertisement at least to announce the membership of this new committee.

Mr. JAMES C. MURRAY. Does this contemplated program include the furnishing of newspaper ads and radio announcements to the member companies for transmittal to newspapers and radio stations in their areas?

Mr. DUNNING. Again I want to make sure, Mr. Murray, we are talking about the same thing. If it has to do with the possibility of another ad on the industry's performance on atomic energy, I do not know whether we will have radio spots. I do not know whether it will be all newspapers or not. We do furnish newspaper mat service and radio commercials to our clients, not necessarily on atomic energy, sir.

Mr. JAMES C. MURRAY. Do you consider this advertisement as an indication of your companies' participation—the companies you represent—in the atomic energy program? Is that correct? That is what I understood.

Mr. DUNNING. Yes, sir. We regard that as an essential part of our service to the American public and we want to keep them informed of it.

MAGAZINES INCLUDED IN ADVERTISING PROGRAM

Mr. JAMES C. MURRAY. Now, in that realm of your planning do you intend to carry on this type of advertising? In other words, relating to the participation of the various companies you represent—I believe you said 120—in the atomic energy program, in magazines and other sources of public information?

Mr. DUNNING. That is all we are in right now, magazines.

Mr. JAMES C. MURRAY. Have you any particular magazines, or do you include every magazine?

Mr. DUNNING. Our present magazine list includes some 30 or 31, sir.

Again this is perfectly all right with me, Mr. Murray, but we go beyond this particular advertisement. This advertisement will not appear in any magazine.

Mr. JAMES C. MURRAY. I see. But if these companies decide to go further in the program, in the atomic energy program, then you will include magazines of the number that you indicated?

Mr. DUNNING. I want to be strictly factual, sir. You are asking me about a preparation of an advertisement that we have not yet conceived. We have different kinds of magazines. We have some magazines where if it were on atomic energy the advertisement would not fit in any way. So it is impossible for me to answer you categorically "yes" or "no" on that. If it is a piece of copy that fits magazine usage, surely, we will put it in magazines or, we might limit it to a certain type of magazine, or we might limit it to newspapers.

COPY IS PREPARED BY THE AYER AGENCY

Mr. JAMES C. MURRAY. You, I imagine, prepare the copy; or does your client?

Mr. DUNNING. My company. We have a big copy staff. As I said in my little remarks, it is my job to bring the facilities of my agency to this client.

Mr. JAMES C. MURRAY. In other words, a particular client or clients will come to you and tell you what they want in the way of advertising some program or opinion or sale or something, and then your people develop that into a program and tell them how to do it; is that correct?

Mr. DUNNING. To a degree. Sometimes it is the chicken and the egg thing. We counsel and advise with our clients who believe in advertising how best to adapt advertising to their business needs. Now, when you say they came to us, mostly we are coming to them because it is our job to serve them. Do I make myself clear?

Mr. JAMES C. MURRAY. I understand that. If you see a good idea for them that is going to assist them in their business you are certainly going to bring that to their attention so that they can accept or reject your ideas.

Mr. DUNNING. We would be remiss if we did not, sir.

Mr. JAMES C. MURRAY. That is right; and you would be poor businessmen if you did not and you probably would not be the successful advertising firm you are if you did not.

But with respect to this particular ad was the idea for this ad generated in your firm or did it come from your clients? I imagine it could come from either source.

GENESIS OF THE ADVERTISEMENT

Mr. DUNNING. The genesis of this ad came from the Edison Institute Annual Convention in Atlantic City early in June. They have an annual convention, usually in Atlantic City.

Many of them talked about their position on the atomic energy problems and they determined—or at least were discussing the creation of a special task force to evaluate technical advances in the art. That grew to the place where it became a reality, an entity. They were going to create a committee. That was news. That was the springboard for this advertisement, sir.

Mr. EVINS. Will the gentleman yield for a question?

Mr. JAMES C. MURRAY. Yes, I will yield to the gentleman.

Mr. EVINS. Mr. Dunning, were you represented at this conference or this meeting in Atlantic City?

Mr. DUNNING. We were very much there; yes, sir.

INTERPRETATION OF ADVERTISEMENT

Mr. JAMES C. MURRAY. Would you interpret this ad, Mr. Dunning, as leaving the impression that America is in the lead in the atomic electric power?

I will make it two questions. If I were reading that ad would you feel I would get that impression, as an advertiser?

Mr. DUNNING. I hope you would, sir.

Mr. JAMES C. MURRAY. Would the effect of that interpretation upon me or a member of the general public not bring the feeling:

"Well, everything is all right. We should not concern ourselves too much, because we are leading in the field and everything is going along all right."

Is that correct; or would that give that impression to the public?

Mr. DUNNING. It is difficult for me to say after quite a number of years in this business how an individual reader will interpret the advertisement, but if it should so work out that it made you feel your light and power company was "on the ball" we would be happy about that, sir.

Mr. JAMES C. MURRAY. In other words, this ad was intended to give the impression that the particular power companies who sponsored the ad were "on the ball," to use a colloquialism, insofar as the atomic energy field was concerned; is that correct?

Mr. DUNNING. Yes, sir. The industry itself was very much aware of the opportunity that might come in years with the atomic electric power.

EDISON ELECTRIC INSTITUTE

Mr. JAMES C. MURRAY. Mr. Dunning, who is the Edison Electric Institute?

Mr. DUNNING. The Edison Electric Institute is the statistical organization of the industry. It is made up of some 187 member companies, I believe, and it has a nationwide or a worldwide reputation, sir, as the statistical repository of everything that has to do with light and power.

Mr. JAMES C. MURRAY. Would this statement be true: "The member companies of the Edison Electric Institute serve 93 percent of the electric consumers receiving service from investor-owned electric utility industries, which, in turn, serve approximately 80 percent of the total number of electric customers in the United States, so the Institute represents suppliers to 75 percent of all users in the industry?" Is that statement correct?

Mr. DUNNING. Mr. Murray, I would say that the figures are in my knowledge approximately correct. I cannot say whether, it is 90 or 91 or 75 or 76 or what.

Mr. JAMES C. MURRAY. I see.

Mr. DUNNING. Generally speaking it is correct.

Mr. JAMES C. MURRAY. Actually I should not have read to you a statement when I did not identify the source of the statement, but for your information and for the purposes of the record the source of my material concerning the member companies is the testimony of Elmer

L. Lindseth, representing the Edison Electric Institute, who was President of the Cleveland Electric Illuminating Company, at the joint hearings of February–March, 1956, at page 535.

Mr. DUNNING. If he said it I would say it was absolutely correct, sir.

ADVERTISING INFLUENCING EDITORIAL POLICY?

Mr. JAMES C. MURRAY. Do you feel as an advertising man, Mr. Dunning, that advertising expenditures have an influence on the news or the editorial policy of newspapers or periodicals that are carrying the ads?

Mr. DUNNING. I want to be careful how I answer this.

Mr. JAMES C. MURRAY. If you want me to repeat the question I will. I certainly do not want you to have an answer that you feel might be jeopardizing you.

Mr. DUNNING. I have a very real answer, because we have been in this business long enough to know darned well that the expenditure of advertising money in a publication will not influence its editorial point of view. If that is the kind of publication you use I am reasonably sure you are going to have pretty "lousy" readership, because they do not——

Mr. JAMES C. MURRAY. What we are talking about are the periodicals, newspapers and the like, that we generally consider mold public opinion. Obviously as an advertising man you want to sell something and you use those papers because they get to the people. Do you feel because of your use of those sources that you might influence their policy?

Mr. DUNNING. I am sure they are not influenced by the particular advertisement we present or publish therein unless the solid validity of whatever we say over a period of time affects public thinking, sir.

Mr. JAMES C. MURRAY. In the placing of this advertisement for your clients have you withheld placing the advertisement with newspapers or periodicals you felt did not represent the viewpoint of your clients?

Mr. DUNNING. No, sir.

Mr. JAMES C. MURRAY. In other words, you would place the advertisement regardless of what the editorial viewpoint of the particular newspaper was with respect to the activity of your clients; is that correct?

Mr. DUNNING. Quite right, sir.

Mr. HAND. Mr. Chairman, will you yield to me for a moment?

Mr. JAMES C. MURRAY. Yes; I will.

RELEVANCY OF THIS INQUIRY

Mr. HAND. Will you bear with me, because I did not have the opportunity of attending the meeting of the full Committee at which this hearing was authorized.

You started out, I think quite properly, by saying that there was no thought in the minds of the Committee, and no allegation of any impropriety on the part of the agency or the clients for publishing this advertisement, and that the hearing was for the purpose of eliciting certain facts. In view of that and with all respect to you, sir, how is any question or any answer so far in this hearing, which

has now gone for a half hour, any of the proper concern of this Committee?

Mr. JAMES C. MURRAY. For this reason, Mr. Hand: I understand your question entirely—if as it is assumed by some this advertisement reflects an erroneous picture of our atomic energy program then the question as to the reason for painting the erroneous picture I think is very pertinent.

Mr. TABER. Why do you not develop the matters in which the advertisement was erroneous, then?

Mr. HAND. I think you are handling the hearing with the utmost fairness and propriety, but I just question the relevance.

Mr. JAMES C. MURRAY. Obviously, you know, lawyers have a lot of different routes to get to an end, and I am probably one of those lawyers who takes the long route, that is all.

RESPONSIBILITY FOR ATOMIC DEVELOPMENT

In your opinion, Mr. Dunning, from your knowledge of the industry and from your knowledge and information you had to develop that was necessary to prepare this advertisement, do you think that the American people can depend solely on the private power companies to assure America's keeping the lead in atomic electric power?

Mr. DUNNING. No, sir; and we did not say that.

Mr. JAMES C. MURRAY. In other words, you think that Government participation is necessary to get a full peacetime utilization of atomic energy; is that correct?

Mr. DUNNING. Can we read the ad a minute?

Mr. JAMES C. MURRAY. Yes, sir.

Mr. DUNNING. If you will look, please, at the first column, third and fourth paragraphs, sir—may I read it, sir?

Mr. JAMES C. MURRAY. Yes; you may, sir.

Mr. DUNNING (reading):

> Much of this research and knowledge has a direct bearing on one of the atom's greatest promises, the production of electric power.

Mr. PHILLIPS. I have not found it yet—oh; I have it.

Mr. DUNNING (reading):

> Far more experimentation will be required to prove which of the many types of reactors are most efficient, most workable and most economical. But we are well on the way to finding out.
>
> Foremost in this experimentation is the basic and comprehensive reactor research program led and carried on by the Atomic Energy Commission. This research puts theories to the test, discovers how to design and build various types of reactors, uncovers basic problems and possibilities, and provides the vital first tries that are necessary before larger and better reactors can be designed and built. Already, these tests are separating the most promising from the least.

Right there, sir, you find an answer to the question, Mr. Murray, that you just asked me. We surely do not claim that we alone can do this whole job, nor do we say that the Atomic Energy Commission is alone. If you would care to read further you will find in the ad a bow not only to AEC, which is in that fourth paragraph, but to "other investor-owned companies," sir. We do not name them, but we could name them, like General Electric, Westinghouse, Monsanto Chemical and many others who are interested in a program of atomic energy.

We do not claim or mean to claim, sir, that we can solve this atomic energy problem for the nation alone. We can solve the atomic electric power end of it, we think, pretty successfully.

PRODUCING ELECTRICITY FROM THE ATOM

Mr. JAMES C. MURRAY. Now, in connection with that last statement, Mr. Dunning, this statement is in the ad, after the paragraph which you read:

> The problem of producing electricity from the atom was solved long ago. But so long as we have adequate supplies of coal, oil and gas that can produce low-price electricity, it would be wasteful for America to build large numbers of atomic-electric power plants which could produce electricity only at high cost.

Does that support confidence that the private companies can be depended upon to push a program which would keep pace with nations like Great Britain and Russia?

Mr. DUNNING. I would think it would, Mr. Murray, for the simple reason, if I may say so, that the American people expect the light and power companies, who have a public service obligation, to be good businessmen.

Mr. JAMES C. MURRAY. And with respect to a good businessman you say that it would be a necessity that a good businessman would attempt to develop this new source of power even though in the development he might have on his hands a power that costs more than the present cost of his customary mode of generating power.

Mr. DUNNING. Mr. Murray, the paragraph before the one you read points out that we are already doing 7. The electric light and power companies already have 7 of these large atomic electric plants on the way or under study. The last paragraph in the lefthand column, sir. It is not as if the industry were sitting on its hands doing nothing, sir.

PRIVATE POWER PLANS

Mr. JAMES C. MURRAY. Do you think the people can depend upon these plans to construct enough large demonstration plants to bring quick reductions in the cost of power so as to assure America's lead?

Mr. DUNNING. May I ask you to repeat that one, sir?

Mr. JAMES C. MURRAY. Since it appears from the ad that these companies are proceeding on the assumption that these atomic power plants will be highly costly, can the people depend upon them to construct enough large demonstration plants to bring quick reductions in cost so as to assure the American lead?

Mr. PHILLIPS. Mr. Murray, would you define the word "quick"?

Mr. JAMES C. MURRAY. Well, I would leave that to the opinion of the person that answers the question, because I do not want to tie him down to any specific times.

Mr. DUNNING. Well, Mr. Murray, the light and power industry has done a pretty successful job of continuously bringing electricity in ample amounts to the American people at constantly decreasing cost. I think they can be depended upon to do that.

Mr. JAMES C. MURRAY. Just prior to this questioning you pointed out a statement in your ad that the electric light and power companies already have seven of these atomic electric plants on the way, or under study.

Will you explain what you mean by "on the way or under study?"

Mr. DUNNING. Yes, sir; when does a thing get on the way? This is the beginning of an utterly new science, and a new art of technology. Nobody knows what the answer is. You have to hire and train scientists.

At Shippingport, Pennsylvania, just outside of Pittsburgh, a plant is already under construction. In New York City under Consolidated Edison Company, they have bought a site up the Hudson River and it would be silly to say that it is not under way because they are spending thousands and thousands of dollars and manpower hours to get started. Now, the bricks and mortar are not there yet, but they will be. The planning goes on. Likewise, in Chicago much planning is being done. This is a terrifically big and important and expensive operation. It must be carefully planned.

I am told that in producing jet bombers it takes about four years from the first drawing board to the production of the first one, and many more years than that for a big bomber. The lead required in this operation surely is equally important.

Mr. JAMES C. MURRAY. You have made the statement in there that there are seven on the way, Mr. Dunning, or under study. Now, "on the way" would appear to me to at least give the impression that there was at least the process of buying the grounds, the plans and specifications being prepared.

To your knowledge, in which seven areas has property been purchased and plans prepared and specifications drawn for the creation of one of these atomic reactor plants?

Mr. DUNNING. Mr. Murray, I would list the seven that we included in there, and they are all big ones. May I give the names to your counsel here, sir?

Mr. JAMES C. MURRAY. Would you read the names, sir, for the purpose of the record.

Mr. DUNNING. The Duquesne Light Company at Shippingport, Pennsylvania; Consolidated Edison Company in New York; at Monroe, Michigan, headed by the Detroit Edison Company under the company name of Power Reactor Development Company, another big one; and then outside of Chicago another one headed by the Nuclear Power Group of seven electric companies including Commonwealth-Edison; the Yankee Atomic Electric Company at Rowe, Massachusetts, which is definitely well under way; the Pennsylvania Power & Light Company; and one down in Florida. I do not think they have bought the site yet, but they are studying sites and determining the many, many ramifications of the important job before they can buy sites.

We regard them as "under way".

There are other small reactors that we do not even include in here. These are big ones.

PRIVATE POWER PLANS CONDITIONED ON LEGISLATION

Mr. JAMES C. MURRAY. It has been represented to this committee that prior to any further entry into this field by various companies there is required legislation.

Would you say that a company that requires legislation before it goes ahead with its plans could be said to have an atomic energy power plant under way?

Mr. SCHEETZ. Mr. Chairman, I know I have no standing here——

Mr. JAMES C. MURRAY. Oh, yes; you have. Go ahead.

Mr. SCHEETZ. I did not understand so. I am a little bit disturbed by your question. I should think the witness ought to be entitled

to know what kind of legislation you are talking about. There is a concern on the part of the companies that if they should join up in this that they might be in violation of the Sherman Antitrust Act and I was just wondering what kind of legislation you are talking about.

Mr. JAMES C. MURRAY. The legislation I am referring to is the need for legislation with respect to insurance coverage and there is a question as to the applicability of the Public Utilities Holding Company Act.

Mr. DUNNING. If I may try to answer it in my insufficient legal knowledge, sir, I would say this: Save for the Holding Company Act legislation and the insurance legislation, I would think that the act of 1954 would give them enough of an open door invitation to proceed, sir.

Mr. JAMES C. MURRAY. But with those conditions attached to their further proceeding, would you say that the plants were under way?

Mr. DUNNING. These seven are, sir, or sufficiently far enough for us to write it in the ad that they are under way. As we say in the ad, "on the way or under study," yes, sir.

We regard these as seven entities.

IS PRIVATE POWER GOING AHEAD?

Mr. JAMES C. MURRAY. How many of the seven have purchased land sites?

Mr. DUNNING. Five.

Mr. JAMES C. MURRAY. And how many of the seven have prepared plans and specifications for an atomic energy producing plant?

Mr. DUNNING. I cannot answer you that, sir, except for Shippingport, which is physically under way.

Mr. JAMES C. MURRAY. I wonder if you are aware of the fact, Mr. Dunning, that the government is putting up $85 million in the Shippingport plant which is the only plant as your statement indicates that is actually building.

Mr. DUNNING. I know the government is paying for the reactor; yes, sir.

Mr. JAMES C. MURRAY. And the Duquesne Company is putting up $5 million which has been certified by ODM for write-off in 5 years against Federal income taxes. Are you familiar with that, too?

Mr. DUNNING. Not in detail, sir. I know Duquesne is contributing a considerable sum of money and the electricity they will get out of it will cost them about, I would say, five times what electricity is costing them now from their regular sources.

Mr. JAMES C. MURRAY. It is going to cost the Government 52 mills for the Shippingport power, and Duquesne will pay the Government only 8 mills for this power.

Would you not say actually that probably a better picture would have been painted if the sentence which I read, or which you referred to, read that the government and the electric light and power companies already have seven of these large atomic energy plants on the way or under study?

Mr. DUNNING. Well, it would be limiting government because the AEC has many other plans under way.

Great Britain and Russia

Mr. James C. Murray. Where are the sources of your information for the statements contained in the heading of your article that Great Britain has seven nuclear reactors built as of 1956, I believe, and 23 building, or being planned? I would like for you, if you can, to give me the source of your information as to Russia and the others.

Mr. Dunning. Yes, sir.

Mr. Phillips. The heading says: "built or planned." Did you say that?

Mr. James C. Murray. I said completed. The first column is headed "Completed as of 1956," and the second column is headed "Building or planned."

Source of information contained in advertisement

Mr. Dunning. Basically, our information comes from the Edison Electric Institute which is, as I said before, the depository for all statistical information affecting the industry.

You will find that material also in the presentations that Mr. Lindseth made, and he was representing the industry when he made them, at the hearings before the Joint Committee on Atomic Energy on May 24 on pages 140 to 150 of record of the hearings.

Mr. James C. Murray. Are you sure of the accuracy of those figures, or are you depending upon Mr. Lindseth's statement?

Mr. Dunning. I am depending upon the Edison Electric Institute and I am happy to hand the counsel a photostatic copy of their most recent findings.

Mr. James C. Murray. Will it be all right to leave that with the counsel?

Mr. Taber. Why do we not have it read? I think we ought to hear that.

Mr. Phillips. I think we should hear it in order that we may check it with the advertisement and know exactly what we are doing as we go along.

Mr. James C. Murray. How voluminous is it?

Mr. Dunning. It is pretty voluminous, and very, very involved, sir.

Mr. Phillips. I thought maybe we could shorten the time by asking the witness to what extent the information he now offers the committee differs from the statement which appears at page 146 in the Joint Committee hearings, or in the mimeographed copy of Mr. Lindseth's testimony. Would that be time-saving?

Mr. James C. Murray. I think that would be time saving.

Mr. Dunning. It would differ, sir, only as to the advance that has occurred in the art since Mr. Lindseth's report.

Mr. Phillips. That would change which figures?

Can you say which figures of the advertisement, if any, would be changed?

Mr. Dunning. Mr. Lindseth reported 89, and we reported 90 in the United States.

Mr. Phillips. One more.

Mr. Scheetz. Mr. Murray, you will find this information on the last sheet of the document which you have there which is a recapitulation of the May 24 tabulation, and the additional information in a separate column, and then a total as of June 12.

Mr. Dunning has now given you the data on the additional reactor.

Mr. TABER. I think we ought to have that in the record of the hearings, at least.

Mr. JENSEN. Mr. Chairman, I think it would be well to include that complete statement as to the number of reactors built in the United States and in these different nations as mentioned in this ad due to the fact that it appears that an attempt is being made to discredit the authenticity of those figures.

Mr. JAMES C. MURRAY. There is no attempt being made, Mr. Jensen, to discredit the authenticity of his figures whatsoever. The attempt is being made to determine the substantiating data for his figures because his figures contained in the advertisement are certainly not supported, at least in my mind, by the figures that were presented to the committee in other hearings.

Mr. JENSEN. That is exactly why I would like to have the complete list and the complete recapitulation which Mr. Dunning has presented, and as shown to the committee, in order to substantiate the statements that he has just made.

Mr. DUNNING. If I do not bore you, I will read the whole thing. It is long and repetitive, but it is pretty detailed, sir.

Mr. JENSEN. I think it is important enough to go into the record. I think those figures are sufficiently important to have them made a part of the record, and I would make that as a request, Mr. Chairman.

Mr. RABAUT. You mean to incorporate it in the record at this time?

Mr. JENSEN. At this point.

Mr. JAMES C. MURRAY. I think it would just be prolonging the hearing unnecessarily with a recapitulation of figures. We are not at all saying that his figures are not included in the statement that he has presented to the committee. It appears that they are, but from the statement that he has presented to the committee, there are a great number of reactors that were certainly never designed for the generation of electrical energy, and it would seem to me that the advertisement leads one to believe that the 90 or 89, as he stated in his testimony before us here, are reactors that are designed to keep the lead in atomic electric power.

Mr. PHILLIPS. Mr. Murray, will you bear with us for just a second? Remember, we do not have a copy of that.

Mr. JAMES C. MURRAY. All of the information here is available to the members of the committee.

Mr. PHILLIPS. I was just going to tell you that we will have to ask questions because we have not gotten copies of that. It seems to me that the record ought to show, before the witness answers, that the advertisement specifically said "reactors built or planned, all types and for all purposes."

I think you can just put the recapitulation in the record. Would not that be enough?

Mr. JAMES C. MURRAY. That would be perfectly all right.

Mr. PHILLIPS. Would that satisfy Mr. Jensen?

Mr. JENSEN. I want to make sure, since the committee has brought these gentlemen before us to testify, that they have every opportunity to prove that the statements they make and the figures they present in this advertisement are correct.

Mr. JAMES C. MURRAY. I want to be perfectly fair with you gentlemen and with the American people. I want the American people to

have the facts which in my opinion is what you purport to give them in this advertisement, and I want you to have the opportunity to prove that they are the facts.

Mr. SCHEETZ. May I make an observation, please?

Mr. JAMES C. MURRAY. Yes.

Mr. SCHEETZ. I think we would prefer to have this of record if the committee is willing, because this document—while I have not checked it myself—I have been told by my clients it conforms to the testimony which Mr. Lindseth gave. As Mr. Dunning stated, it adds new information that came to light after Mr. Lindseth's testimony. I might in explanation of the fact—and Mr. Dunning can testify to this—state that we got this recapitulation after the ad, and the writing, but we had the information orally ahead of time.

If you would care to look at the recapitulation, at the end you will see that since May 24 the additional information indicates that there is one more reactor in the United States which increases it from 89 to 90; that there are no more in Soviet Russia; that there are two more in Britain increasing it from 28 to 30, and in all other countries combined, six more, increasing it from 18 to 24. The detail on those appears in the early part of this statement.

Mr. JAMES C. MURRAY. Is it your suggestion that we ought to put the entire recapitulation in the record?

Mr. SCHEETZ. Yes, sir.

Mr. JAMES C. MURRAY. Without objection, it will be inserted into the record at this point.

(The matter referred to follows:)

Nuclear reactors in the United States, completed, under development, planned or applied for

Nuclear reactors in the United States, completed, under development, planned or applied for

PRESSURIZED WATER REACTORS WATER COOLED AND MODERATED

Name	Owned by	Location	Function	Date of operation	Source
Low Intensity Reactor MTR Mock-up	AEC	Oak Ridge, Tenn	Research	1950	R
Materials Testing Reactor	AEC	Arco, Idaho	Testing	1952	R
Submarine Thermal Reactor, Mark I	Navy	Arco, Idaho	Submarine	1953	R
Submarine Thermal Reactor, Mark II	Navy	Nautilus	Submarine	1955	R
Shippingport	AEC-Duquesne	Shippingport, Pa	Power	1957	R X
Westinghouse Test Reactor	Westinghouse	Blairsville, Pa	Testing	1957	R X
Engineering Test Reactor	AEC	Arco, Idaho	Testing	1957	R X
Army Package Power Reactor	AEC	Ft. Belvoir, Va	Power	1957	R X
University of Florida Reactor	University of Florida	Gainesville, Fla	Research	1959	R X
Yankee Atomic Electric Co	Yankee Atomic Elec Co	Rowe, Mass	Power	1960	R X
Consolidated Edison Co	Consolidated Edison Co	Indian Point, N. Y	Power	1960	R X
Submarine Fleet Reactor	Navy	(1)	Submarine	(1)	R X
Large Ship Reactor	AEC	Arco, Idaho	Large Ship	(1)	R X
Submarine Advanced Reactor	AEC	West Milton, N. Y	Submarine	(1)	R X

BOILING WATER REACTORS WATER MODERATED AND COOLED

Boiling Experimental Reactor Borax I (Destroyed)	AEC-ANL	Arco, Idaho	Experimental	1953	R
Boiling Experimental Reactor Borax II (Rebuilt as Borax III)	AEC-ANL	Arco, Idaho	Experimental	1954	R
Boiling Experimental Reactor Borax III	AEC-ANL	Arco, Idaho	Power Prototype	1955	R
Experimental Boiling Water Reactor	AEC-ANL	Lamont, Ill	Power Prototype	1956	R
General Electric	General Electric	Livermore-Pleasanton, Calif	Research-Power	1957	1 X
Nuclear Power Group (Dual Cycle)	Commonwealth Edison	Morton, Ill	Power	1960	R X
Elk River	Elk River Rural Electric Coop Assn	Elk River, Minn	Power	1960	R X

SWIMMING POOL REACTORS, WATER MODERATED AND COOLED

Bulk Shielding Reactor	AEC-ORNL	Oak Ridge, Tenn	Research	1950	R
Convair Research Reactor	Not Stated	Ft. Worth, Texas	Research	1953	R
Tower Shielding Reactor	AEC-ORNL	Oak Ridge, Tenn	Research	(1)	R
Pennsylvania State University	Penn State University	University Park, Pa	Research	1955	R
University of Michigan	University of Michigan	Ann Arbor, Mich	Research	1956	R
Naval Research Laboratories	Naval Research Lab	Washington, D. C	Research	1956	R
American Machine & Foundry	A M & F	New York City Area	Research	1956	R
Battelle Memorial Institute	BMI	Columbus, Ohio	Research	1956	R

See footnotes at end of table, p. 262

Nuclear reactors in the United States completed, under development, planned or applied for—Continued

SWIMMING POOL REACTORS, WATER MODERATED AND COOLED—Continued

Name	Owned by	Location	Function	Date of operation	Source
Livermore Laboratory (Low Power Test Reactor)	AEC	Livermore, Cal	Research	1957	R X
Oak Ridge Research Reactor	AEC	Oak Ridge, Tenn	Research	1957	R X
Omega West	AEC	Los Alamos, N M	Research	(1)	R X
Watertown Arsenal	Watertown Arsenal	Watertown, Mass	Research	(1)	R X
Washington State	Washington State	Pullman, Wash	Research	(1)	R X
HOMOGENEOUS REACTORS					
Low Power Water Boiler	AEC	Los Alamos, N. M	Research	1944	R
High Power Water Boiler	AEC	Los Alamos, N. M	Research	1944	R
Super Power Water Boiler	AEC	Los Alamos, N. M	Research	1951	R
Homogeneous Reactor Experiment (Dismantled)	AEC	Oak Ridge, Tenn	Research	1952	R
Homogeneous Test Reactor 1 (Dismantled)	AEC	Oak Ridge, Tenn	Power Prototype	1952	R
North Carolina State Reactor	N. C. State College	Raleigh, N. C	Research	1953	R
Los Alamos Power Reactor 1	AEC	Los Alamos, N. M	Power Prototype	1956	2
Los Alamos Power Reactor 2	AEC	Los Alamos, N. M	Power Prototype	1956	2
Homogeneous Test Reactor 2	AEC	Oak Ridge, Tenn	Power Prototype	1956	R
Armour Research Foundation	Armour Research Fdtn	Chicago, Ill	Research	1956	R
Gamma Corp	Gamma	Mansfield, Mass	Research	1956	R
UCLA Medical	UCLA	UCLA Medical Center	Research and Treatment.	1956	R
Wolverine	Wolverine Elec Coop	Vic, Hersey, Mich	Power	1959	3 X
Pennsylvania Advanced Reactor	Penn Pr & Lt Co	Pennsylvania	Power	1962	R X
North American Aviation	Not Stated	Downey, Calif	Research	(1)	R X
HEAVY WATER REACTORS					
Chicago Pile 3 Modified to—	AEC	Chicago, Ill	Research	1944	R
Chicago Pile 3'	AEC	Chicago, Ill	Research	1950	R
Chicago Pile 5	AEC	Lamont, Ill	Research	1953	R
Mass Institute of Technology	MIT	Cambridge, Mass	Research-Medical Therapy.	1957-59	R X
Chugach	Chugach Elec Assn	Vic, Anchorage, Alaska	Power	1961	3 X
Savannah River (5 reactors)	AEC	Aiken, S. C	Production	(1)	R
Brookhaven Medical	AEC	Upton, N. Y	Research	(1)	R X
GRAPHITE REACTORS					

GRAPHITE REACTORS

Chicago Pile 1 Rebuilt as	AEC	Chicago, Ill	First Reactor	1942	R
Chicago Pile 2	AEC	Chicago, Ill	Research	1943	R
Oak Ridge X-10 Area Reactor	AEC	Oak Ridge, Tenn	Isotope Production	1943	R
Hanford 305 Test Reactor	AEC	Hanford, Wash	Testing	1944	R
Hanford (8 Reactors)	AEC	Hanford, Wash	Production	1944	R
Brookhaven National Laboratory	AEC	Upton N. Y	Research	1950	R
Thermal Test Reactor	AEC	Schenectady, N Y	Research	1951	R
Sodium Reactor Experiment	AEC, NAA	Santa Susanna, Cal	Power Prototype	1956	R
Nebraska Group	Consumers Pub Pr Dist	Nebraska	Power	1959	R X
Holyoke	City of Holyoke, Mass	Vic, Holyoke, Mass	Power	1960	3 X

LIQUID METAL FUEL REACTORS

Liquid Metal Fueled Reactor	AEC	Brookhaven, N Y	Research-Power	1959	R X
Orlando	City of Orlando, Fla	Vic, Orlando, Fla	Power	1960	3 X

FAST BREEDER REACTORS

Experimental Breeder Reactor 1	AEC	Arco, Idaho	Research	1951	R
Experimental Breeder Reactor 2	AEC	Arco, Idaho	Power Prototype	1959	R X
Power Reactor Development Co	PRDC	Monroe, Mich	Power	1960	R X

ORGANIC MODERATED REACTORS

Organic Moderated Reactor	AEC	Arco, Idaho	Research-Power	1957	4 X
Piqua	City of Piqua, Ohio	Vic, Piqua, Ohio	Power	1960	3 X

VARIOUS TYPE REACTORS

Los Alamos Fast Clementine (Dismantled)	AEC	Los Alamos, N M	Research	1946	R
Sodium Intermediate Reactor Mark A	AEC	West Milton, N Y	Land-based Prototype Submarine.	1955	R
Sodium Intermediate Reactor Mark B	AEC	Submarine Sea Wolf	Submarine	(1)	RX
Aircraft Reactor Experiment	Not Stated	Not Stated	Experimental	(1)	RX

See footnotes at end of table, p. 262.

Nuclear reactors in the United States completed, under development, planned or applied for—Continued

TYPE NOT YET SELECTED

Name	Owned by	Location	Function	Date of operation	Source
Florida Group	Not Stated	Tampa Bay Area	Power	1962-63	5 X

[1] Not stated.

X-Reactors to be in operation after 1956.

Sources: Nuclear Reactor Data—prepared by Raytheon Manufacturing Co., November 1955.
Releases, Atomic Energy Commission
Semi-Annual Reports, Atomic Energy Commission
Various newspaper and magazine sources.

NOTE.—Specific sources shown in added source column as follows:
R-Nuclear Reactor Data—prepared by Raytheon Manufacturing Co., November 1955
1-AEC Release 829, May 15, 1956
2-19th Semi-Annual Report of EAC, January 1956—page 45
3-AEC Release 777, February 7, 1956
4-AEC Release 806, April 6, 1956
5-N Y World Telegram & Sun, May 5, 1956

Nuclear Reactors in the World

Completed, under development, planned, or applied for

Country	Pressurized water	Boiling water	Swimming pool	Homogeneous	Heavy water	Graphite	Liquid metal	Fast breeder	Organic moderated	Various types	Not specified	Total
U. S. S. R.	2 R				1 R	4 R					[1] 10 B	[1] 17
India			1 R									1
Switzerland			1 R		1 R							2
Canada					4 R							4
France					2 R	2 R						4
Norway-Holland					2 R							2
Sweden					1 R							1
Britain					2 R	16 A, R		2 R			8 A	28
Italy					1 R							1
Australia					1 R							1
Belgium						1 R						1
West Germany						1 R						1
Total, excluding United States	2		2		15	24		2			13	63
United States	14	7	13	15	11	17	2	3	2	4	1	89

[1] Including U. S. S. R.'s 5-year program (1956–60) during which time they claim they will build 10 different types of reactors. Data on types not available.

Note.—Basic source for this data was primarily from publication of Raytheon Manufacturing Co., Nuclear Reactor Data, November 1955. Other sources were also used. Of the data in its publication, Nuclear Reactor Data, Raytheon Manufacturing Co. said the following:

"This chart has been compiled by the Nuclear Power Group of the Raytheon Manufacturing Co. to provide a comprehensive outline of the reactor field during its first 13 years. All known reactor projects throughout the world are represented—whether in actual operation, under construction, or in the late planning stage. Practically all of the basic data now available are believed to be included."

Added Note—Specific Sources:

R—Nuclear Reactor Data, Raytheon Manufacturing Co., November 1955.

A—British White Paper, A Programme of Nuclear Power, February 1955, Atomic Industrial Forum Memo vol. 2, No. 7, p. 32.

B—New York Times, Mar. 4, 1956.

Nuclear reactors in Great Britain

	Name	Type	Owner	Location	In operation
R	Dimple	Heavy water	AEA	Harwell, England	1954
R	Harwell Research	do	do	do	1956
R	Calder Hall [1]	Graphite	do	Calder Hall, England	1956
	Do. [2]	do	do	do	1956
R	Zephyr	Fast breeder	do	Harwell, England	1954
R	Dounreay	do	Elec Auth	Dounreay	1957
8 reactors, 10-year program [1]		Gas-cooled graphite moderated.	do		1960–63
	Do. [1]	Not specified, possibly liquid cooled.	do		1963–65
6 reactors [2]		Gas cooled, graphite moderated.	AEA		([3])

[1] A Programme of Nuclear Power, British White Paper, February 1955.
[2] Atomic Industrial Forum Memo, vol 2, No. 7 (July 1955), p. 32.
[3] To be started in 1956 or 1957.

R Nuclear Reactor Data, Raytheon Manufacturing Co., November 1955.

Nuclear reactors in U. S. S. R.

	Name	Type	In operation
R	RFT	Pressurized water	([1])
R	Russian research	Heavy water	1949
R	APS-1	Graphite	1954
R	APS-1 type	do	1956
R	APS-1 type	do	1956
R	RFT	do	1952
R	Thermal research	Reactor PWR	([1])
10 reactors [2]		Russian 5-year program	([3])

[1] Not stated.
[2] New York Times, Mar. 4, 1956.
[3] By 1960.

R Nuclear Reactor Data, Raytheon Manufacturing Co., November 1955.

Other reactors in world

	Country	Name	Type	In operation
R	Canada	Zeep	Heavy water	1945
R	Canada	NRX	do	1947
R	France	Zoe	do	1948
R	Dutch-Norway	Jeep	do	1951
R	France	Saclay-P-2	do	1952
R	Swedish	Swedish	do	1954
R	Canada	NRU	do	1956
R	Belgium	RBI	Graphite	1956
R	France	G-1	do	1956
R	Switzerland	Gen Conf (United States built).	Swimming pool	1955
R	Australian	Research	Heavy water	1957
R	Canada	NPD	do	1958
R	Switzerland	Research	do	
R	Norway	Norwegian power	do	
R	France	G-2	Graphite	1957–58
R	West German	West German	do	
R	India	Trombay	Swimming pool	
R	Italy	Cise	Heavy water	

R—Nuclear Reactor Data, Raytheon Manufacturing Co., November 1955.

REACTORS IN WORLD

Information on certain additional projects May 24–June 13

Name	Owned by	Location	Function	In operation	Source
United States:					
Special power excursion reactor, test 1	AEC	Arco, Idaho	Safety test	1956	(1).
Sweden:					
75 megawatt reactor			Heating	1960	(2).
100 megawatt reactor			Power	1963	(2).
Belgium:					
Exhibition reactor (United States built)			Power	1958	(3).
100 megawatt reactor			Power	1960	(4).
France:					
G–3				1957–58	(5).
50–60 megawatts				1960	(6).
Britain:					
Gleep				1947	(7).
Bepo				1948	(7).

[1] Nucleonics, June 1956, p. 44.
[2] Swedish White Paper, An Atomic Power Programme.
[3] Atomic Industrial Forum Memo, vol. 2–12, December 1955.
[4] Atomic Industrial Forum Memo, Aug. 1, 1955.
[5] Atomic Industrial Forum Memo, vol. 3, No. 2, February 1956.
[6] New York Times, Oct. 28, 1955.
[7] Nuclear Reactor Data, Raytheon Manufacturing Co., November 1955.

Recapitulation

	May 24 tabulation	Additional information	June 12 tabulation
United States	89	1	90
U. S. S. R	17	0	17
Britain	28	2	30
Other countries	18	6	24

ACCURACY OF TABLES

Mr. EVINS. The gentleman testifies to one other reactor found. Is that on the books, or is it being planned? Is that in the imaginery category, or is it under construction?

What is the additional one that you add to make the total 90?

Mr. DUNNING. I will have to look at my records. I do not think I can tell you from this, sir, where the additional one is located, but I would like to read a letter——

Mr. EVINS. Mr. Chairman, I want to object to putting into the record an article to be a matter of record containing statements to which the witness has testified that he has not checked himself. He is requesting to put in the record a list of reactors under development throughout the country which the advertising agency witness testifies he hasn't checked. Then he summarily says another one should be added, and he is unable to tell us where it is or its present condition.

Mr. PHILLIPS. But the Chairman asked him for the source of the information which he included in his statement, and he answered that question. If you challenge the accuracy of the information, you must go back of his statement and get the witnesses who supplied the information to this witness.

Mr. EVINS. I merely want it to appear as a matter of record that I object to putting voluminous information in this connection in the record which is not thoroughly and completely substantiated.

Mr. PHILLIPS. It is not very big.

Mr. EVINS. And which they will probably use as a basis for future advertisements, and say "this is a matter of Congressional record."

Mr. TABER. It is already in the record.

Mr. JENSEN. That is splitting hairs.

Mr. TABER. It is already in the record except for one plant in the United States.

Mr. DUNNING. What is your name, sir?

Mr. EVINS. Evins, of Tennessee.

Mr. DUNNING. Thank you, Mr. Evins. I would like as an advertising agency man to say that we are pretty long on research. We do a great deal of it. We cannot do it maybe as thoroughly as the technicians of the Edison Electric Institute, but we also serve many other advertising accounts in the United States, and we believe them when they tell us things. For instance, if Plymouth told us last week that they had made one million automobiles, I would not try to count them. We would take their word for it. We have faith in the statistical veracity of the Edison Electric Institute. They are so staffed that they can give such information to us and they gave it to Mr. Lindseth which is reflected in his testimony before the Joint Committee. We still believe they do it as well as any place in the world from which you can obtain that sort of information.

Mr. EVINS. Would the gentleman yield for one other observation at this point?

Mr. JAMES C. MURRAY. Yes; I will yield to the gentlemen from Tennessee.

Mr. EVINS. In the debate in the Senate on this matter, with which I am sure the gentleman is familiar, reference is made to a bill introduced by Congressman Cole of the House, directing the Chairman of the Atomic Energy Committee to plan for construction of a small demonstrator reactor here in Washington for demonstration purposes for tourists, students, and others who may visit the Nation's Capital.

Is this proposed reactor included in your list of 90?

Mr. DUNNING. I doubt it, sir.

Mr. EVINS. Well, you have failed to take into consideration legislation introduced on a bi-partisan basis in both Houses of Congress.

Mr. PHILLIPS. This is an advertisement for the private utilities. Are the private utilities building the one at the Capitol?

Mr. EVINS. He is talking about the total number planned or under way.

Mr. TABER. In other words, you doubt if he has gotten his figure high enough?

Mr. EVINS. I doubt that his figures are accurate.

Mr. JAMES C. MURRAY. Mr. Dunning, you did not suggest that the 55 or the 90 in your article were built by private utilities?

Mr. DUNNING. We did not claim it, sir, in any way.

Mr. JAMES C. MURRAY. In fact, they were not? Is that not correct?

Mr. DUNNING. Yes, Mr. Chairman.

Mr. PHILLIPS. Yes. I stand corrected.

Mr. EVINS. Do the figures include Borax I, II and III which in reality are one?

Mr. DUNNING. Yes, sir.

Mr. BOLAND. Mr. Murray, may I ask one question?

Mr. JAMES C. MURRAY. Yes, sir; I yield to the gentleman from Massachusetts.

Mr. BOLAND. What is the responsibility of your agency, Mr. Dunning, for checking with your clients as to the truth or veracity of information given to you to be put into particular ads? All of the information that comes to your agency, whether from the electric light and power companies of America or from any of your other clients, I presume is used to draw up these specific ads in ways which you think would be most favorable to them. It that not correct?

You attempt to select the ideas that they give to you. Do you check the truth or veracity of the statements that are given to you?

Mr. DUNNING. To a certain extent, if the situation requires it.

Mr. BOLAND. Did you do it in this instance? Did your advertising agency, on its own, determine for itself from sources other than the American Independent Electric Light and Power companies whether or not the information that was given to you with which to draw up this particular advertisement was true? I mean the facts as they were presented to you?

Mr. PHILLIPS. Mr. Boland, do you mean, did they go to Russia and count them?

Mr. BOLAND. No; I do not mean that. I think our big problem is not so much with Russia as it is with the problem in our own country and how we are progressing here. I would not expect one to go to Russia. I presume you might have some information available to you as to what the situation is in Russia, and Great Britain, and all the others, but with respect to the information given to you by the Independent Electric Power Companies, do you check the information that they give you as to the truth of it?

Mr. DUNNING. We regard the Edison Electric Institute as the finest available source of factual information. We do not go behind or beyond them.

Mr. JAMES C. MURRAY. Mr. Dunning, at that point this ad's heading: "How America Will Keep Its Lead in Atomic Electric Power" being immediately followed by "This is the way nations rate in nuclear reactors built or planned, all types and for all purposes," would certainly lead one to believe that there were 55 completed as of 1956, and 35 planned in the United States which were capable of producing electric power, when in fact your list of reactors disclosed you included in your list of 90 every reactor—that is, so far as the 55 were concerned—that the Atomic Energy Commission or anyone else completed, and, in fact, the 55 were actually completed by the Atomic Energy Commission.

Mr. DUNNING. Yes, sir; we included them, sir, but I do not think that we expect the readers to presume that all 55 are producing electric power. I do not think we say that.

IMPRESSION CREATED BY ADVERTISEMENT WITH RESPECT TO 5,000 KILOWATT REACTOR

Mr. JAMES C. MURRAY. How many reactors are to be completed, if you know, by Great Britain by the end of 1956, which will have a power capacity of 5,000 kilowatts or greater?

Mr. DUNNING. Now, you throw me back to a real careful study of this data, sir, and I cannot answer you offhand. I will have to take time, I think, to answer that question, if you wish me to do so.

Mr. PHILLIPS. Where did you get that figure?

Mr. JAMES C. MURRAY. Well, I did not get that figure from the advertisement at all.

I am directing my questions, Mr. Phillips, from the viewpoint of the impressions I felt one would get from the advertisement and then comparing the impressions which were obtained from hearing the testimony.

Mr. PHILLIPS. You have departed from the advertisement, and the effect of the advertisement upon the people is what we are supposed to be asking about.

Mr. JAMES C. MURRAY. I have not, because I think a fair inquiry, Mr. Phillips, is an inquiry into the specific items he included.

Now, he obviously got that data from some place.

Mr. PHILLIPS. Yes; and he so testified.

Mr. JAMES C. MURRAY. And he also testified as to what he meant when he said what was included in those items. Now, I am going into a line of inquiry to determine or to develop that feature of it.

Mr. PHILLIPS. I think the Chairman is conducting a good line of questioning, but I did not get the connection in my mind between a figure as to the number of kilowatts and what reaction was produced in the mind of the ordinary American reader of this newspaper, rather than a member of the Committee on Appropriations, if you get my point.

PURPOSE OF INQUIRY

Mr. JAMES C. MURRAY. Well, I think our inquiry actually is not necessarily for the purpose of the American reader. It is also, I think, for the information of the committee members.

Mr. PHILLIPS. Well, wait a minute. That raises an entirely different question in my mind.

You mean we have gotten these gentlemen down here to testify before this committee because you think this advertisement inserted in the Star is going to influence this particular committee one way or the other, as against information which this committee has had accurately for 10 years?

Mr. JAMES C. MURRAY. Actually, Mr. Phillips, the purpose of getting the gentleman down here was not a quirk concceived in my mind at all. So, the reason they are down here as far as the committee is concerned is something that one would have to poll each of the individual members of the committee about. As far as my own mind is concerned, I am just trying to evolve facts concerning this advertisement that I think are of importance in our jurisdiction.

Mr. SCHEETZ. Mr. Murray, could I ask a question there?

Mr. JAMES C. MURRAY. Yes.

Mr. SCHEETZ. I am a little ignorant on this. I had supposed that the fundamental question here was "where does the United States stand in the development program?"

Mr. JAMES C. MURRAY. That is correct.

Mr. SCHEETZ. And not the impression that this ad might create here and there. I had supposed that that was the fundamental function of your committee.

Mr. JAMES C. MURRAY. I think that is correct.

Mr. SCHEETZ. While we are not objecting, and are glad to answer any objective questions as to what impressions yielded from this advertisement, I may say——

Mr. JAMES C. MURRAY. Do you not feel that that question, however, is pertinent to the question which you pose? "Where does America stand in the Atomic Energy Program?"

Mr. SCHEETZ. Well, I think that is——

Mr. JAMES C. MURRAY. Or where we stand from the standpoint of atomic electric power?

Mr. SCHEETZ. May I suggest that that is quite a different question than the impression which someone might happen to get out of the advertisement. As I understood, there have been other statements made presumably based upon other factual data and we came here primarily to explain to you where we got our data, which was from the Edison Electric Institute.

Mr. JAMES C. MURRAY. I would like to find out what that data includes.

Mr. SCHEETZ. We have given you the whole basic basis for the factual data; what you might call the narrative. As I say, we are glad to answer these questions if we can, but it seems to me they have a subjective effect.

Mr. JAMES C. MURRAY. I think that we spent more time on the one question than the question was worth and we have not received the answer to it.

Mr. SCHEETZ. I might add that I have a certain responsibility for it because I saw it myself before it was published.

GREAT BRITAIN AND RUSSIA

Mr. JAMES C. MURRAY. What are the types and power capacities of the reactors planned by Great Britain and Russia? Do you have that information?

Mr. DUNNING. If you will look on page—I have not got the page number, but there is a page that says "nuclear reactors in Great Britain," and you will get the types, the owners, the locations, but not the amount of power.

Mr. JAMES C. MURRAY. That is included in the report that is already included in the record?

Mr. DUNNING. Yes, sir.

Mr. JAMES C. MURRAY. Can you explain to me how a comparison of numbers of reactors planned in your mind or in your organization's mind or in your organization's plans assures that America will keep its lead in atomic electric power?

Mr. DUNNING. Well, we think, and it is our opinion, that we are well ahead now, and we think we will keep ahead. So does England think that, judging from an excerpt that Chairman Strauss read to the committee last week. I guess that is covered in the report before the Joint Committee.

Mr. JENSEN. You mean, Mr. Dunning, that England thinks that the United States is ahead, and will keep ahead in the atomic energy electric power field?

Mr. DUNNING. Yes, sir; I meant to say that, Mr. Jensen, if I did not.

Mr. PHILLIPS. At what page?

Mr. DUNNING. It is in there, and I would guess it is on page 140, but it may be 72.

Mr. VAN METER. It is 72.

Mr. JAMES C. MURRAY. Did you get it, Mr. Phillips?

Mr. PHILLIPS. Yes, sir; I have it. Thank you very much. It is very interesting.

Mr. DUNNING. It is very interesting reading, and it ends up by stating that we are pretty far ahead of them.

NEWSPAPERS IN WHICH ADVERTISEMENT INSERTED

Mr. SCHEETZ. Mr. Murray, before you get into a new line of questioning, you are under the impression that the list of newspapers in which this was published is of record, but I do not think that any such exhibit was offered. The green sheet does not include it.

Mr. JAMES C. MURRAY. I had assumed you had prepared a list, and offered it.

Mr. SCHEETZ. I have, but it did not go in with the green sheets.

Mr. JAMES C. MURRAY. That is all right. It will. Do you want to present it now, or later?

Mr. SCHEETZ. We will present it before the hearing closes.

(The material referred to follows:)

N. Y. Herald Tribune, N. Y. Times, Washington Post Times Herald, Washington Star, Cleveland Plain Dealer, Detroit News, Detroit Free Press, Chicago Tribune, St. Louis Globe Democrat, St. Louis Post Dispatch, Minneapolis Star, Minneapolis Tribune, St. Paul Dispatch, St. Paul Pioneer Press, Denver Post, Christian Science Monitor, Wall Street Journal, San Francisco Examiner, Oakland Tribune, Los Angeles Times, Boston Herald, Boston Traveler, New Orleans Times Picayune, New Orleans State, Dallas News, Atlanta Constitution, Atlanta Journal, Des Moines Register, Des Moines Tribune, Seattle Times, Kansas City Times, Kansas City Star, Phila. Bulletin, Philadelphia Inquirer, Baltimore Sun, Pittsburgh Press—all daily insert.

Mr. JAMES C. MURRAY. Thank you, sir.

POWER CAPACITY OF REACTORS

I refer to the sheets you gave us concerning the nuclear reactors in the United States completed, under development, planned or applied for, which we included in the record, explaining the numbers included in your ad. The list does not show the power capacity of these various completed or planned reactors. In the atomic electric power field the power capacity of our reactors and of the foreign country's reactors, if we make a comparison between our situation, Great Britain and Russia, is important, and I am wondering if you have available information showing the power capacities of the various reactors?

Mr. DUNNING. I do not have the information as to the capacity of the reactors. We did not see the pertinence of it as you undoubtedly do, sir, but we can urge you to have your inquiry directed to the Edison Institute which will undoubtedly enlighten you if you desire to have that information.

I do not recall whether Mr. Lindseth's testimony covered that or not.

Mr. JAMES C. MURRAY. You did not consider that in the preparation of your advertisement; is that right?

Mr. DUNNING. No, sir; because you see, Mr. Murray, this art is in its infancy. However, even the smallest reactor is important. You will notice here that some of the functions of these small reactors include research work. Every one of the smallest reactors will teach us as we go along how to avoid other things. I do not know what kind

of car you drive, but I believe it is reasonable to assume that your first car—not you, Mr. Murray, but maybe Mr. Jensen's first car—was a Maxwell.

Mr. PHILLIPS. Do not overlook me. The first car I drove was a Maxwell.

Mr. DUNNING. The automobile industry learned something from that automobile, and what they learned may be found on your new automobile.

Mr. PHILLIPS. And the first automobile I owned was a Hupmobile. These foreign cars look to me as if they are making the same kind of car I had in 1911.

Mr. DUNNING. Every reactor, no matter how small, contributes to our general knowledge, and it is a brand-new technology, sir.

Mr. JAMES C. MURRAY. Actually, is it not a fact, then, that of all these reactors included in your statement the far greater percentage of them are just experimental reactors that have little or no generating capacity?

Mr. DUNNING. Many of them have none, sir, because as far as we know or now see atomic energy in terms of electric power, it is a new fuel.

Mr. JAMES C. MURRAY. Suppose I posed the question as to whether America is behind in the development of atomic electric power; would you say that this ad would give me the complete facts on the question as to whether present programs assure that America will keep its lead in future years?

Mr. DUNNING. I hope it will, sir. It was our intent to have it so.

ELECTRIC COMPANIES HAVE BUILT NONE OF THE 55 COMPLETED REACTORS

Mr. JAMES C. MURRAY. How many of the 55 reactors completed by the end of 1956 have been completed by the electric companies or have been built by the electric companies?

Mr. DUNNING. I would say none, sir. The electric companies were not permitted to get started on this thing until a few years ago.

Mr. JAMES C. MURRAY. I have reference now to those which they are building at this time, and for which they have purchased property which I believe is only two according to your statement.

LARGE ATOMIC POWER PLANTS—ONLY ONE STARTED

Mr. DUNNING. I said five, I believe, that they have purchased property for, and seven is the correct figure on which you might center your attention, because these are large atomic electric power reactor plants. They are big ones.

Mr. JAMES C. MURRAY. Well, what is your definition of a "big one," Mr. Dunning?

Mr. DUNNING. 60,000 kw. and up. I may be wrong on that. I am not an engineer.

Mr. JAMES C. MURRAY. I understand that, but I just wanted to get your opinion on it. I appreciate the fact that you are an advertising man, Mr. Dunning, and not an engineer, of course.

Mr. DUNNING. Mr. Murray, for instance, in that list of seven there is a reactor out in California reasonably close to finishing—Santa

Susana, California. It is reasonably near done, and we do not even include it, because it is only 5,000 kws., I believe.

Mr. JAMES C. MURRAY. But, in fact, there is only one where construction is being started, and that is the one at Shippingport, and the government is making a substantial contribution to the construction of that one; is that not correct?

Mr. DUNNING. You are quite right, sir.

Mr. PHILLIPS. No; that is not correct.

Mr. DUNNING. I mean of the big ones, sir.

Mr. JAMES C. MURRAY. Of the big ones, that is correct.

Mr. PHILLIPS. Mr. Murray, define the word "started," again.

Mr. JAMES C. MURRAY. I define the word "started" as being under construction.

Mr. PHILLIPS. That is the actual building itself?

Mr. JAMES C. MURRAY. That is what I define as "started."

Mr. PHILLIPS. But that must stand as the Chairman's interpretation, and not necessarily what other people interested in this subject would say about it.

Mr. JAMES C. MURRAY. I understand. That is the reason I defined the word "started."

Mr. TABER. Do they not start a building when they turn over the first spade full of dirt? That is what they always advertise.

Mr. JAMES C. MURRAY. I was not attempting, Mr. Taber, to put an engineering definition on the word "started." It is obvious from Mr. Dunning's testimony that what he means by "started" is——

Mr. PHILLIPS. Drawing the plans.

Mr. JAMES C. MURRAY. These plans that we have heard questions about and many of which I would define as merely being on the drawing board.

Mr. PHILLIPS. Yes; as he said in his headline "built or planned." Also, as a member of the Appropriations Committee, I would think that they had started when they began to spend money on it, and had put millions of dollars into the planning. I should think anyone would consider that they had started. Would you not, Mr. Murray?

Mr. JAMES C. MURRAY. Would I?

Mr. PHILLIPS. Yes.

Mr. JAMES C. MURRAY. Not necessarily, Mr. Phillips.

Mr. PHILLIPS. No matter how much money they put in before they get a brick down they have not started?

Mr. JAMES C. MURRAY. I might hire counsel to start preparing legislation which I might propose to introduce to assist me in going into a particular field and I certainly would not suggest that that expenditure was a start on a nuclear reactor program.

Mr. PHILLIPS. I will bet you a silver dollar that when you write your constituents as to how you are getting along with that particular bill, you write them saying "We have started work on it."

Mr. JAMES C. MURRAY. I would not say that unless it was actually introduced, Mr. Phillips. I do not want to be technical, and that is why I am trying to define what I mean by the term.

Mr. PHILLIPS. Neither are we, but I have something here which I think is a specific answer to the previous question you asked. Do you want it to go into the record now or shall I wait?

Mr. JAMES C. MURRAY. Well, if it is appropriate, it can go into the record at this time.

KILOWATT CAPACITY OF REACTORS

Mr. PHILLIPS. You asked why the advertisement did not specifically give the number of kilowatts, feeling that such information was an important part of the advertisement. I cite from the statement of Mr. Charles Weaver who is the Vice President of Westinghouse, and who is in charge of the nuclear program for that company, at page 353 of the Joint Committee hearings to which reference has previously been made:

"With that event . . .," by which he means the reactor plant in Idaho in 1953, "our country took first place in the world's atomic power program. I do not believe that we shall ever lose that position of leadership so long as we continue to concentrate on advancing the art through the most profitable use of our resources, technical manpower, industrial know-how and facilities. I vigorously support Admiral Strauss' statement that kilowatts should not be regarded as the measurement of accomplishment."

That is the end of the quotation.

Mr. JAMES C. MURRAY. Thank you.

MOST PROMISING TYPES OF REACTORS

Now, Mr. Dunning, the ad says we are well on our way to finding out which type of reactors are most efficient, most workable and most economical and that AEC tests are supporting the most promising from the list.

If this statement is true, will the Atomic Energy Commission indicate that such private utility projects as those of the Yankee Atomic Electric Company and Consolidated Edison are to be the most promising type of reactors?

Mr. DUNNING. Are you asking me whether the AEC finding predicts they will be the most promising, or are the most promising?

Mr. JAMES C. MURRAY. Do they indicate that they are the most promising, yes, sir; that is the question.

Mr. DUNNING. I cannot answer that question.

Mr. SCHEETZ. Are you sure you understand?

Mr. DUNNING. I think I understand what he means. I do not know whether the AEC feels they are the most promising now, or not; neither do I think—and this is conjecture on my part—neither do I think that the sponsors know.

Mr. JAMES C. MURRAY. Do you have any idea, Mr. Dunning, what are the most promising types of reactors?

Mr. DUNNING. I do not; no, sir. Boy! You cannot get me into that one, because the greatest scientists in the world have not any idea on that one yet.

Mr. JAMES C. MURRAY. For the purpose of my question, your ad would at least lead one to believe that we are well on the way.

Mr. DUNNING. Oh, we have made great progress, amazing progress in the two years private industry has been going into it.

Mr. JAMES C. MURRAY. Then you make the statement that nobody in the world has any idea?

Mr. DUNNING. I cannot tell you how involved and intricate this art is.

Mr. JAMES C. MURRAY. Do you know how soon reactors of the type that are the most efficient and most workable will be completed by private industry?

Mr. DUNNING. All I can tell you is that Shippingport expects to produce electricity there in 1957, and there is a little reactor at West Milton and one at Arco, Idaho, of the AEC that are producing electricity. I do not know whether they are regarded as a commercial success, or not; I would not think they are.

Mr. JAMES C. MURRAY. But the one at Shippingport, as the previous testimony has indicated, is actually one that the Government is participating in?

Mr. DUNNING. Sure; yes, sir. And the AEC owns the two little ones that are producing electricity now.

ATOMIC ELECTRIC PROBLEMS SOLVED?

Mr. JAMES C. MURRAY. The ad also says that "The problem of producing electricity from the atom was solved long ago." What do you mean by "long ago"?

Mr. DUNNING. I think at Arco, Idaho, they have been lighting that little town with it for two years. Prior to that, of course, they had to build it, so they must have understood the answer. And atomic energy, as we now see it in electric thinking is merely another fuel, Mr. Murray.

(NOTE.—The Arco plant was run only for 1 hour and 5 minutes to supply electricity to the town. That was on July 17, 1955.)

Mr. JAMES C. MURRAY. Would you say the problem of producing electricity from the atom was really solved?

Mr. DUNNING. In the development of the art, sir, tomorrow they may find a new way of producing it without the benefit of a generator. I cannot tell you when that will come. Leading people think it will come. So when we say the problem of producing electricity from the atom was solved long ago, we know it was solved in one way. It may be better tomorrow, or next week it may be improved, because that is part of the study.

Mr. JAMES C. MURRAY. You do not mean then, Mr. Dunning, that the problem is solved to the point where you are producing competitive electric power?

Mr. DUNNING. That is right. But to get it, we know how to get it; we do not know yet how to produce it economically or competitively.

STATUS OF PRIVATE POWER PLANS—NO PLANTS UNDER CONSTRUCTION IN 1956 AND 1957

Mr. JAMES C. MURRAY. The ad refers to $300 million being "involved in the planning and construction of atomic-electric plants, atomic energy and related research." How much of this amount, if you know, relates to plants definitely to be put under construction in 1956 and 1957?

Mr. PHILLIPS. Where is that?

Mr. JAMES C. MURRAY. Right under the heading "Electric Companies Build."

Mr. PHILLIPS. Oh, yes.

Mr. DUNNING. Well, may I refer, sir, to Mr. Lindseth's testimony in trying to answer your question? Mr. Lindseth acted as spokesman

for the industry and he is a member of the electric companies' advertising program. He said on page 141 that—

More than 300 million private enterprise dollars are involved in the planning, construction, and attendant research for these plants which together will have an ultimate capacity in excess of 1,100,000 kilowatts.

Then he goes on to say that the reactors proposed by the Commonwealth Edison Company and the Pennsylvania Power and Light Company and the large scale reactor proposed by the three Florida utility companies and the little ones built by the General Electric Company and the Pacific Gas and Electric Company total a private investment in the five reactors of $191 million.

Now, when you say what would it be in terms of final completion of the building in 1955 and 1956, I cannot answer you, sir.

Mr. JAMES C. MURRAY. Then you cannot break down that figure of $300 million in construction amount, at all; is that correct?

Mr. DUNNING. That is right. But the $300 million includes research as well as construction.

Mr. JAMES C. MURRAY. Do you know how much of that $300 million relates to projects like those of the Pennsylvania Power and Light and the Florida utilities which actually may never be built at all?

Mr. DUNNING. Mr. Murray, I just read you the names of five that total $191 million.

Mr. JAMES C. MURRAY. Do you know how this $300 million compares to the investment in atomic power plants to be made by Great Britain and Russia over the same period of years?

Mr. DUNNING. I do not know that, sir.

CONVENTIONAL GENERATING PLANTS

Mr. JAMES C. MURRAY. Do you know how it compares to the planned total investment by private power companies in conventional generating plants over the same period of years?

Mr. DUNNING. I would say it would be much less.

Mr. JAMES C. MURRAY. In other words, you would say the power companies' planned investment in conventional generating units is much greater?

Mr. DUNNING. Far greater; because the power companies have an obligation——

Mr. JAMES C. MURRAY. I understand. They have an obligation imposed by law, as a matter of fact.

Mr. DUNNING. And by their belief in their job, which is a public service job. They have to keep planning.

Mr. SCHEETZ. May I make the suggestion that perhaps the dollar investment is not very significant if you are comparing the United States with other countries?

Mr. JAMES C. MURRAY. I understand that, and he answered also that he did not know.

CONSTRUCTION OF PLANTS NEEDED TO ASCERTAIN MOST PROMISING TYPES OF REACTORS

Now, Mr. Dunning, will you tell me how you can reconcile these two statements in the ad? The ad says that "Already, these AEC tests"—it does not say "AEC;" it says "tests"—"Already, these tests

are separating the most promising from the least"—"promising" meaning the types of reactors.

Mr. DUNNING. Yes, sir.

Mr. JAMES C. MURRAY. And later the ad says "Until they", meaning the large experimental plants—"Until they provide operating experience, no one will know which types are most useful for further development."

Mr. DUNNING. That emphasizes the terrific problem that is posed before these companies. With all of their scientific appraisement, they cannot tell that until they get the operating experience.

"AMERICA'S INDEPENDENT ELECRTIC LIGHT AND POWER COMPANIES"

Mr. JAMES C. MURRAY. What is meant by the phrase "America's Independent Electric Light and Power Companies?" Has it some meaning, or is it just a name?

Mr. DUNNING. It is not a power trust; these are separate companies.

Mr. JAMES C. MURRAY. How many of those companies are subsidiaries of holding companies, or are any of them?

Mr. DUNNING. In the 120 that we represent, as far as I know, there are, maybe, four or five.

Mr. JAMES C. MURRAY. Does this ad represent the studied consensus of opinion of all 120 companies?

Mr. DUNNING. In accordance with our method of running the electric companies' advertising program.

Mr. JAMES C. MURRAY. Did they make a specific agreement about this ad; if so, how was it ascertained?

Mr. DUNNING. We had a meeting in Atlantic City of what we call our management group. We have a management group meeting a certain number of times a year and to those meetings are invited the executives of all of our client companies, attended in number by anywhere from 30, to 60, to 80. The action of that individual meeting stands accepted by the rest of the people who do not attend; and that is what happened at Atlantic City.

Mr. JAMES C. MURRAY. In other words, you did not go to each of the companies and get specific authorization on behalf of that company to run this particular ad?

Mr. DUNNING. We never do that, sir.

Mr. JAMES C. MURRAY. You never do that?

Mr. DUNNING. We never do; but I am careful to inform them of what we are doing; but we never go specifically to each one.

Mr. JAMES C. MURRAY. Does this group have officers?

Mr. DUNNING. No, sir; this is more of an amorphous group. We have no officers or offices; we have no executive secretary.

ADVERTISING PROGRAM PROCEDURE

Mr. JAMES C. MURRAY. When you decide on an advertising program that you want to put into effect for the companies, ordinarily how would you know what the other companies concurred in the program?

Mr. DUNNING. Our advertising procedure is unlike anything that exists in advertising today. We first meet with the advertising managers and public relations men of the client companies in the prepara-

tion of the advertising. When we work the idea out, work the copy out, it is then submitted to the management group meeting for policy approval. Those meetings are held at various places at various times; but the action of each management group is final.

Mr. HAND. If the gentleman will yield, how does the advertising procedure or the relationship of N. W. Ayer & Company and their clients assist this committee in making appropriations for the Atomic Energy Commission?

Mr. JAMES C. MURRAY. It is just background material. It was a digression in order to ask him when he adopted another program how he secured their agreement.

Mr. HAND. But does it not strike you as being a little unusual that this committee should be trying to elicit facts which do not bear upon any legislation proposed with respect to the Atomic Energy Commission from N. W. Ayer Advertising Agency?

Mr. JAMES C. MURRAY. I do not believe so—not when the N. W. Ayer Advertising Agency presents an advertisement that would indicate, at least to me, that we are far in front of the field as far as atomic energy is concerned. Then, after the testimony before the committee indicates or creates, at least in my mind, another effect, I certainly think maybe they have some information that was not presented to the committee.

INTERPRETATION OF THE ADVERTISEMENT

Mr. PHILLIPS. May I question one word in the question of the Chairman? I have been searching for something in the advertisement that says we are away in the lead or that says anywhere that we are in greater lead.

Mr. JAMES C. MURRAY. I do not think I made that statement. I think I made the statement that I had gained the impression from the advertisement that we were in the lead in atomic energy.

Mr. PHILLIPS. But you did use the comparative phrase "in greater lead."

Mr. JAMES C. MURRAY. That is the impression the ad gave me.

Mr. PHILLIPS. My point is simply that there is nothing in the ad that gives me any impression that our lead is as great or greater than has been testified by members—scientists and members of the Atomic Energy Commission before this committee—which is the point, I take it, that Mr. Hand is trying to bring out. And if we are going to raise any question in this committee on the basis of one member of the committee's reaction to it as opposed to another member of the committee's reaction to the advertisement, we may end up with a somewhat extended hearing.

Mr. EVINS. If the gentleman will yield I should like to observe that if individual Members are giving testimony as to their own impressions of the advertisement, as apparently are some members on that side of the table and the Chairman, I should like to add my own.

Mr. PHILLIPS. I think it is quite proper, as the Chairman has given his, and Mr. Hand has given his, and I have a question as to what they both mean. You may resolve it.

Mr. EVINS. I am sure I won't resolve it to the satisfaction of my friend, but I am sure our action compliments the advertising agency to have one of their ads considered by this committee. The ad implies to me that the United States is far ahead in the field of

atomic energy developed. We know as a matter of fact from testimony that we are not far ahead, and I for one think the ad is very misleading. It gives a very deceptive and erroneous impression of the true facts of the situation, as I view the situation, based upon the testimony which this committee has heard.

Mr. PHILLIPS. That certainly would be one person's opinion, but let us see why you think the ad is misleading when it appears to be inviting attention to the figures of productivity of electric energy and what the Atomic Energy Commission has to say.

Mr. EVINS. The ad, as the gentleman knows, appeared on the morning that the Appropriations Committee initiated its hearing with respect to the Atomic Energy Commission here in the Nation's Capitol, with probably some view of influencing Members of Congress with respect to facts or their votes on matters of appropriation.

Mr. PHILLIPS. I think that might be a proper question, rather than some of these we have asked. I think it also might be a proper question to ask if the Atomic Energy Commission, which certainly would be the only one interested in the appropriation—whether this advertisement had any influence upon its attitude, or its answers on the matter of the appropriation.

MISLEADING WORDING AND FORMAT OF ADVERTISEMENT

Mr. RABAUT. I would like to say the way this ad would strike me as a layman. The only word on this whole page on one line by itself, and the most significant is the word "power." It is all alone. It is a very well-written ad; I want to compliment you on that.

Mr. DUNNING. Thank you.

Mr. RABAUT. The most signicant word is "power," and you go over to the next heaviest print under "U. S. A.; Great Britain; Russia; All Others." The type is small above, but it says "Completed as of 1956" and then "Building or planned" and it shows in these figures that the U. S. A., in the first column, is 55 and, in the second column, 35. And then all of the other countries are in lesser numbers.

Now the only thing that strikes me as peculiar is that while these numbers are set forth I fail any place to see anything concerning these numbers that indicates the principal word on this page "power." No place do we see any record of "kilowatts" or what a kilowatt is—no place. And then the ad concludes, farther down in heavier type, attributed to "America's Independent Electric Light and Power Companies."

Then further it has this box continuation below which says "Where do we go from here?" Now who is "we"—the America's Independent Electric Light and Power Companies? No place in this ad is the word of "Government" used, although the Government has put $15 billion into this effort.

You can say the effort was for weapons, or 80 percent was for weapons, but the real purpose, the final purpose of this effort by the United States Government for atomic energy, is going to be for peaceful energy beneficial to mankind.

I think in that respect that the absence of the great contributor in this ad is an error. I feel as an individual that the Government has not ever been given any credit, and it should, even if only in a line. The Government has spent millions and billions for developing atomic

energy. But this ad would lead one to think that the whole amount, everything that has been done—it is the man on the street that I am talking about—has been done by the America's Independent Electric Light and Power Companies. Then it says "Where do we go from here?"

Mr. HAND. Now will the Chairman yield, so I can make an observation to my friend?

Mr. RABAUT. Just a minute. I want to bring up again that this word "power" is all alone, and the emphasis in this ad is "power" and every advertising man will tell you that, and you admit that, too. No place does it say that the power that is being developed in these figures is being developed by us and not the various companies. And even when we ask the question here in this meeting, we do not know how many of the 55 perhaps produce no power at all. So they are just numbers. Sure they are in the stage of learning about it; I admit that; but, in that respect, I feel this ad is misleading. That is my impression.

Mr. TABER. Will the gentleman yield for a statement?

Mr. RABAUT. No; just a minute. I want to see if I am wrong.

Mr. TABER. I am wondering if the gentleman would read——

Mr. RABAUT. Just a minute.

Mr. TABER. Would you mind reading the advertising?

Mr. RABAUT. No; I am talking here to Mr. Dunning. Maybe I am wrong in my appraisal of what is powerful on this page—am I wrong in my appraisal? When you make a citation of these different units and the numbers that are set forth for the various countries, am I wrong in saying it is misleading when I see no place where it is recorded that some of them would not produce a thing?

Then, when you come down to the bottom, you print the name of who is doing this and say "Where do we go from here?" You ought to have Uncle Sam's picture right there and say "Where is he going from here; how much further is he going?"

I appreciate the contribution of the independent companies to this and my name is on the tower, as one man who worked hard for it, that takes electric power across the river to Canada for the Detroit Edison Company. I come from Grosse Pointe and I am open for criticism if I am wrong. I would like to hear from you what you think of my appraisal of that ad. My appraisal, I would say, is one that would be made by a layman. It is the only appraisal I could make as a Member of Congress. Why was the Government's position in this great development so completely forgotten or ignored?

Mr. HAND. Now, will the gentleman yield to me?

Mr. RABAUT. No. I have asked Mr. Dunning to answer my question.

Mr. HAND. You decline to yield to me to make a correction?

Mr. RABAUT. No; I do not want to be corrected.

Mr. HAND. Well I want to correct you.

Mr. RABAUT. You wait just a moment. You can correct me when Mr. Dunning has answered my question. I am asking Mr. Dunning a question.

Mr. JAMES C. MURRAY. Mr. Rabaut has the floor and he has asked Mr. Dunning a question.

Mr. DUNNING. I am happy indeed to have your reactions and comments. It may be as you say that "power" is the predominant word

there. Personally, I do not think so. I think the whole headline is equivalent in size with "power"; but the reason we did not put kilowatts in, the investment of the money in these reactors that are produced by the Atomic Energy Commission, is that it would complicate it beyond human understanding, or public understanding. Even if it is a simple ad, we seldom use "kilowatts." People do not know what in the world they are and they get confused by that, and if we talk about 60,000, 5,000, or 15,000, they do not know whether they are big, little, or anything else. So we avoid it when we run an ad designed for public consumption.

As for the Government itself, I think we made an honest bow to the Atomic Energy Commission which, to our mind, was the Government in Atomic Energy. Maybe the print should have been bigger, and in italics, or something; but we meant to give the Atomic Energy Commission its full due.

As to the box, the purpose of this ad——

Mr. JENSEN. What paragraph do you refer to; will you read that?

Mr. DUNNING. No, 4, on the Atomic Energy Commission.

Mr. TABER. Why don't you read that?

Mr. RABAUT. No; he is answering my question. Now, you have gotten down to the box. Tell us about this box.

Mr. DUNNING. The real springboard for this advertisement is found in the action of the Edison Electric Institute in creating, for the first time, the Electric Industry Exploratory Committee and Technical Exploratory Committee under the leadership of the greatest scientific minds in the atomic energy industry. Those of us who are close to industry have found that to be pretty exciting. It was a promise to the people of the nation that the electric light and power industry would keep alert and do their best to stay alert. So that was the springboard for the ad. That is the way we in the advertising business would guess at this, if you want me to guess, as to how people would read this; read that, and then read the box [indicating].

Mr. RABAUT. I think you are right.

Mr. DUNNING. If we put the scientific studies in that, sir; say we read down here about the news of the new task force in the box—I cannot quarrel with you, where we say "Where do we go from here?" that maybe we should have phrased it differently, because I have been in the advertising business long enough to know that good advertising can be written in many different ways.

Mr. RABAUT. Right.

Mr. DUNNING. This ad, for instance, could have been put in one-eighth of a page. Instead of that, we decided to use a full page. And some people, in my old days of advertising, would say "My God, you cannot waste all that white space; you have to put something in that white space."

Mr. RABAUT. Why did you decide to use a full page?

Mr. DUNNING. Because it is impressive. We wanted to make an announcement and we used a full page to make an impression.

I am sorry that somebody has not asked me about the last paragraph in the box. To my mind it is the most amazing statement coming from privately owned industry that here we are going to spend many, many thousands of dollars to build this task force and "The findings of this task force, as well as all other experience and

knowledge of America's power companies in the field of nuclear reactors, will be shared with any group dedicated to the objective of maintaining American leadership in atomic-electric power." Personally, I think that is a mighty big statement.

Mr. RABAUT. I want to state I have no quarrel with obtaining the help of private industry; in fact, I welcome it; but we are talking about this ad. I think when you consider the amount of money the Government has invested, and has invested for the benefit of our own country and for the benefit of the world, and, of course, private industry is going along with us on this, you will understand why I asked you about this.

Mr. HAND. I think my friend said in this advertisement there was no mention any place of the "Government." In the second paragraph of the advertisement the phrase is used "At the present time, for instance, the Atomic Energy Commission, the electric companies and various other organizations", and in the fourth paragraph there is a more impressive statement that "Foremost in this experimentation is the basic and comprehensive reactor research program led and carried on by the Atomic Energy Commission."

I suggest that refers favorably, if the gentleman please, to the Government.

Mr. RABAUT. Oh, yes.

Mr. TABER. When I asked the gentleman to yield, I just wanted to emphasize that the gentleman was mistaken when he intimated to Mr. Dunning that there was no recognition of the Government's part in the job; that was all. I just wanted to be sure.

Mr. HAND. The gentleman is almost never mistaken, so that was why I called it to his attention in this instance.

Mr. TABER. That is a supreme recognition of the gentleman's usual correctness.

Mr. EVINS. Will the gentleman yield?

Mr. RABAUT. Yes.

MISLEADING OMISSIONS IN THE ADVERTISEMENT

Mr. EVINS. I am pleased that the gentleman has yielded to me, because the gentleman has referred to the omissions in this ad, and the failure to disclose, the failure to provide full information, as the gentleman well knows, has been held by some of the commissions of this Government and also by the courts to be just as false as an affirmative false statement.

Mr. TABER. But he did not fail to disclose.

Mr. SCHEETZ. May I ask are we going to be interrogated on a violation of the Federal law? I do not intend to have my client object at all, because I think he can answer all of the questions and I am confident that this ad would stand on a test of the law; but I do think if the inquiry is going to take the direction of a violation of Federal law——

Mr. JAMES C. MURRAY. From what inference do you get it is going to take that direction?

Mr. SCHEETZ. I am just asking the question.

Mr. EVINS. Counsel I am sure will agree with me that the courts and some of our Federal commissions have held that failure to disclose the

full facts in a given case in many instances has been as false and misleading as though an affirmative false statement has been made, as I think counsel knows.

Mr. SCHEETZ. No; I think the statement would be failure to disclose material matters. I was only saying if the question is raised that this ad violates the law in any respect, I want to know whether that will be a subject of inquiry.

Mr. JAMES C. MURRAY. I stated in my opening statement that there was no evidence before the committee and we would presume none exists of a violation of any law, and the inquiry is not directed to that at all.

Mr. SCHEETZ. I got the impression, at least the inference is about to be thrown out, that this was a violation of law in the failure to disclose material matters.

Mr. JAMES C. MURRAY. I think Mr. Evins meant that it was misleading insofar as the impression anybody gained from it, but it was not intended that it was along the lines that it was misleading in the sense of involving a violation of Federal statutes or State statutes.

Mr. EVINS. Of course we know and I am sure counsel will agree that if a product is sold or a piece of merchandise is sold on the basis of advertisements which are false and misleading——

Mr. PHILLIPS. What is misleading about this advertisement?

Mr. EVINS. I am making the observation that if a product, merchandise, or whatever it is is advertised and sold, then it would be subject to the jurisdiction of the Federal Trade Commission for false and misleading advertising.

Mr. SCHEETZ. That is a question of law.

Mr. EVINS. I make that statement as an affirmative proposition and will stand on it. Also, I would state if anybody makes a false statement regarding another, that might be a matter of libel. But when you come to an abstract subject like electric power that is neither a product nor an individual and therefore the field is wide open, as to claims that can be made, and there are misleading statements being made in this field. The failure to disclose fully material facts or information has been held by the commissions and the courts as misleading, the same as making a false affirmative statement itself.

Now we have laws with respect to products; we have laws with respect to individuals; but, when it comes to an abstract something like electric power, I repeat, and, as the gentleman has said "kilowatts," why there is no statute on the books to protect against false and inaccurate advertising.

Mr. TABER. But there has been no failure to disclose.

Mr. EVINS. That is a matter of interpretation in my opinion.

Mr. TABER. No; that is a matter of whether you can read.

Mr. JAMES C. MURRAY. We have a quorum call now and the witness needs a rest. I wonder if we could adjourn for a few minutes and go up and answer the rollcall.

Mr. PHILLIPS. So far as I am concerned, this hearing is so flat that I think we had better adjourn permanently. But I would like to read about ten lines into the record.

(The committee thereupon took a short recess.)

Mr. JAMES C. MURRAY. Will the committee come to order, please.

Mr. PHILLIPS. How much longer do you contemplate carrying on the hearing? I have a doctor's appointment at 5 o'clock. I shall have to leave in about 15 minutes.

Mr. JAMES C. MURRAY. Before the hearing continues, I wanted to bring this up. I understand Mr. Phillips said——

Mr. PHILLIPS. I asked you if you knew how long this would continue. I would appreciate being permitted to read about 10 lines into the record before I leave.

Mr. JAMES C. MURRAY. I certainly think we could have the 10 lines.

ST. LOUIS POST-DISPATCH EDITORIAL

Before you do that, we received a telegram from the St. Louis Post-Dispatch, which I would like to read into the record. It is addressed to:

Chairman CLARENCE CANNON,
House Appropriations Committee,
United States House of Representatives, Washington, D. C.

On Tuesday, June 26, The Post-Dispatch received a telephone call from House of Representatives Appropriations Committee Counsel John J. Donnelly inviting an editorial representative of this newspaper to attend an Appropriations Committee hearing at 2:00 P. M., Friday, June 29, in Washington. Mr. Donnelly said the Committee desired to have a Post-Dispatch representative testify as a witness in connection with a Post-Dispatch editorial entitled, "Losing The Peaceful Atom?" published Sunday, June 24. Mr. Donnelly said that a Post-Dispatch editor could voluntarily accept the invitation. He also said that the Committee had authorized a subpena which the editor might prefer to have served at the time of the hearing. On Wednesday, June 27, I sent you a telegram acknowledging Mr. Donnelly's telephone call. The telegram stated that the Post-Dispatch would give prompt consideration to the Committee's action. The Post-Dispatch believes that it would be a profound disservice to freedom of the press as guaranteed by the First Amendment to the United States Constitution for an editorial representative of this newspaper—

meaning the St. Louis Post-Dispatch—

to permit himself to be questioned by a Committee of Congress concerning an editorial. If he were to answer on how the newspapers formed its opinions and to describe the sources on which they were based, he would be submitting to abridgement of freedom of the press. The Post-Dispatch therefore cannot accept the Committee's invitation and will not be represented at the Friday hearing.

IRVING DILLIARD,
Editor of the Editorial Page, St. Louis Post-Dispatch.

Mr. TABER. Well, the only thing I care to say on that is that the telegram itself is an admission that the statements and charges made in the editorial are erroneous.

Mr. JENSEN. And unfounded.

Mr. PHILLIPS. I would certainly say this——

Mr. JENSEN. And would give aid and comfort to the enemy.

Chairman CANNON. In this connection the testimony adduced before this Committee proves every statement made in the editorial.

Mr. TABER. That is very questionable.

Chairman CANNON. Furthermore, he cites statements by Dr. Libby and statements by Commissioner Murray which fully corroborate the position he takes.

Mr. PHILLIPS. I would suggest, in view of the limitation of time, we do not review the testimony of the last four days while these witnesses are on the stand.

I am not sure I think it is an intentional admission of error, or the fact that the editorial is erroneous, nor that it is even an admission, but I do say this: If the proceedings of this committee now being

carried on are based on the fact that this advertisement somehow affected the thinking of the American people to the disadvantage of our security or our confidence or our morale or the recognition of Congress—no proof yet having been adduced of its inaccuracy from these witnesses; nor do I think these are the witnesses we should be interrogating—it seems to me that we should promptly excuse these witnesses and call off the whole thing because certainly an editorial in any paper anywhere which specifically says—and I forget the exact quotation—that the atomic energy program has completely failed——

Mr. JENSEN. Has collapsed.

Mr. PHILLIPS. Has collapsed——

I quote from the editorial:

> Congress is completing an agonizing reappraisal of the atomic-power policy that has collapsed—

It seems to me that that does more damage to the morale of the American people than anything that has been read into, or exists, in this advertisement that now appears before us. I just state that as my opinion, that I think the Post-Dispatch ought, as a patriotic—I agree with a good deal of this, Mr. Chairman, on the matter of the freedom of the press and the right to write editorials as they please.

Chairman CANNON. I think the gentleman will agree any great newspaper in the Nation would take the same position.

Mr. PHILLIPS. I think so. I agree with that. In fact, I question our authority to interrogate these witnesses about an advertisement, but that is different. I am trying to say that I think the Post-Dispatch would want to come voluntarily and reveal the basis upon which they made the statement in the first sentence, which I think would be damaging to the morale of the people. I think maybe it would be well for the chairman to write a letter and say:

> This is not a question of putting you on a griddle; this is a question of asking you if you have information which supports the first sentence, because if you have this Committee should know about it.

Mr. Chairman, very briefly may I read these lines?

Mr. JAMES C. MURRAY. Just one point on your statement, Mr. Phillips.

Mr. PHILLIPS. Yes.

Mr. JAMES C. MURRAY. I believe the telegram that the editor of the St. Louis Post-Dispatch sent is to make his position clear. I think his editorial was a service to the American people.

Mr. PHILLIPS. A service or a disservice?

Mr. JAMES C. MURRAY. A service.

Mr. PHILLIPS. A service?

Mr. JAMES C. MURRAY. Because I think it was an attempt to awaken the American people's interest in this program.

To continue, Mr. Phillips: I think the tenor of Mr. Dilliard's telegram is not that he refuses to appear before the Committee to testify but rather because he feels that since the invitation was coupled with the force of a subpoena that there is an abridgment of the newspaper's right.

Mr. TABER. Neither one is an abridgment of the press.

Mr. JAMES C. MURRAY. That is correct, but I think that was his interpretation.

Mr .TABER. There is nothing in the telegram that supports his position in the slightest degree. It is simply a matter that if he had facts

that he could produce to support it that was what he would be asked. Now, he has not got any and he admits it.

Chairman CANNON. All he has to do is read the hearings before this Committee.

Mr. TABER. Then he will be sure he was wrong.

Chairman CANNON. And that will demonstrate the truth of every statement.

Mr. PHILLIPS. May I complete my statement?

Mr. RABAUT. Who has the floor?

Mr. JAMES C. MURRAY. Mr. Phillips has the floor.

Mr. RABAUT. Why does this come up now?

Mr. PHILLIPS. Because the Chairman (Mr. Murray of Illinois in the chair) read in the record a telegram from the St. Louis Post-Dispatch.

I think the question lies between the counsel of the Committee, perhaps, and the editor of the St. Louis Post-Dispatch as to what he told him, but I do not think that is important.

I think the issue is this: Mr. Murray said this does the nation a service. If the paper had said:

Congress is completing an agonizing reappraisal of an atomic energy policy which this paper believes has collapsed—

or—

which has been reported to have collapsed—

or—

which under all information at your disposal we believe has collapsed—

it would be different. It did not. It said:

Congress is completing an agonizing reappraisal of an atomic power policy that has collapsed.

That I think is a disservice to the morale and security of the United States—and it is not true.

May I read this, please, before I have to leave.

Mr. RABAUT. What is the decision about this? Are we going to take it up in executive session?

Chairman CANNON. We can hear the Commission on Tuesday.

Mr. JENSEN. I think right at this point——

Mr. JAMES C. MURRAY. Mr. Phillips wanted to read that into the record. I think he ought to have the opportunity.

Mr. PHILLIPS. Mr. Murray, if you want to put this in before this discussion it is all right.

Mr. JAMES C. MURRAY. Whatever you want.

Mr. PHILLIPS. This is important, I think, in view of questions asked the witness.

EDISON ELECTRIC INSTITUTE REPORT

Sometimes we have to look at statements which have been made in the past when we think of the future. I am now quoting from the Edison Electric Institute, which I still think ought to be the witness and not these people. This is their June 1954 report. That is 2 years ago. I quote from page 12, as a part of the summary, and I will give this to the reporter:

Atomic power technology is progressing rapidly and a few large atomic power reactors may come into operation within 5 years. A long period of development

lies ahead, however, before the engineering problems and economic justification of atomic units can be brought into focus. After perhaps 10 years the use of this source of energy for a part of our power supply may become a reality.

This development, directed in a rational manner, should create no unusual problems for the electric power industry. The industry should take a leading part to avoid unrealistic and wasteful steps which could have disturing results.

That is the end of my quotation. That is point 4 in their summary. I think that is what I read into this, and if we are offended because Ayer did not say "Government" spelled G-o-v-e-r-n-m-e-n-t instead of "Atomic Energy Commission" maybe this hearing has been of benefit to Mr. Dunning. I am not so sure it has been of benefit to the Subcommittee.

Thank you very much.

Mr. JENSEN. Mr. Chairman?

Chairman CANNON. Off the record.

(Discussion off the record.)

Mr. JENSEN. Mr. Chairman?

Mr. JAMES C. MURRAY. Yes, sir.

COOPERATION BETWEEN AEC AND PRIVATE INDUSTRY

Mr. JENSEN. I think it should be said while these gentlemen are before the Committee that Admiral Strauss, the Chairman of the Atomic Energy Commission, as well as other members of his staff had the most complimentary words to say about the atomic energy scientists in private industry, and they also said that these private industry people were working in complete unity with the Atomic Energy Commission and they gave the private utilities and their scientific staffs great credit for the progress that had been made in the atomic energy field.

Certainly there is no dissension that we can sense between the Atomic Energy Commission or any of its staff and the part played by the private utilities and the scientists that are working for the private utilities of America.

I think that should be stated in the presence of you gentlemen, so that you will know that this hearing, where we invite you gentlemen before the hearing, was not held at the instance of or because of anything anyone in the Atomic Energy Commission had said before this Committee or any place else to my knowledge.

Thank you, Mr. Chairman.

Mr. DUNNING. Thank you, Mr. Jensen.

Mr. JAMES C. MURRAY. Mr. Dunning, to continue our questioning——

Mr. TABER. How much longer is this to run?

Chairman CANNON. We hope to finish very shortly. The gentleman and I have been both fortunate enough and the country unfortunate enough for us to have been here for a long time. The gentleman knows we are nearing the end of the session. In order to get rid of this proposition, the gentlemen before us have been very courteous to come down gratuitously at their own expense, and I do not think we should ask them to come back. If it is agreeable to the Committee, we will here them out.

Mr. EVINS. Will the gentleman yield?

Would it be permissible for me to ask a few questions before we close?

Mr. JAMES C. MURRAY. Yes.

SIGNIFICANCE OF DATE OF ADVERTISEMENT

Mr. Dunning, during the discussion here just prior to the time we recessed for a few minutes there was some question about the ad appearing on the same date that the Committee first met, June 13, 1956, to commence hearings on the Atomic Energy Commission appropriation bill for fiscal year 1957. Is there any significance in the ad appearing on that date?

Mr. DUNNING. None at all, sir. The ad was born on June 6th. I mean born in rough outline. It was passed and authorized. We were instructed to get it in the newspapers as soon as we could. That was Wednesday noon on June 6th. We wrote the ad, polished it up, and had it approved and placed, and it was in the newspapers on the following Wednesday, Thursday, and Friday. We had no knowledge of any meeting of your Committee. In fact, we did not know about your Committee.

Mr. JAMES C. MURRAY. Was the ad cleared with anybody in the Atomic Energy Commission prior to its being inserted, or did you just assume that was not necessary?

Mr. DUNNING. No; we did not clear it with them, sir. Out of courtesy, because of our reference to them, we showed the ad to them without asking for clearance or comment or criticism.

Mr. JAMES C. MURRAY. Did they give you any comment on the ad at all?

Mr. DUNNING. They were pleased at our thoughtfulness in presenting it to them.

Mr. JAMES C. MURRAY. I might say we are pleased at your kindness in coming over and expressing this willingness to testify in connection with it.

Mr. DUNNING. Thank you, Mr. Murray. I am a novice at this. This is my first appearance before such a committee, and I am very pleased with the courteous treatment you have given us.

Mr. JAMES C. MURRAY. Well, you are doing very well. I would say that.

Mr. DUNNING. Thank you, sir.

PRIVATE POWER HAS NOT FINANCED ANY OF THE 55 REACTORS

Mr. JAMES C. MURRAY. Do you know who has supplied funds with which to build and operate these 55 reactors which are indicated as being completed in the United States? I mean by that, has any private company supplied the funds to build any of those 55?

Mr. DUNNING. Some of them. The American Machine and Foundry, the Consolidated Edison Company——

Mr. JAMES C. MURRAY. I mean the funds and not who is constructing them. I mean who supplied the funds.

Mr. DUNNING. In the case of Consolidated Edison, they are putting up all the money themselves.

Mr. JAMES C. MURRAY. But that is not one of the 55. How many of the 55 are paid for by private utility companies, or any other type of private business?

Mr. DUNNING. Mr. Murray, I would have to review all this data and answer you then. I would say quite a number, but nothing to compare with the dollars that the Government has put into it.

Mr. JAMES C. MURRAY. Is it not a fact that private industry has not as yet supplied the funds for any atomic reactors or nuclear reactors already completed?

Mr. DUNNING. Already completed? I think you are right, sir. Remember, we were only permitted to come into this program two years ago.

Mr. JAMES C. MURRAY. How many reactors have private utilities actually placed under construction, and by the term "placed under construction," I mean substantial physical structure or erection at the plant site?

Mr. DUNNING. Well, you do not count Duquesne, I assume, because everytime you mention it you have stressed the fact that Government money is in there in great measure.

Mr. JAMES C. MURRAY. That is correct.

Mr. DUNNING. But, Duquesne is doing their part of the job. I do not know of any others, sir, in construction.

Now, remember, it costs a lot of money to plan this.

Mr. JAMES C. MURRAY. I understand. I used the words "placed under construction." I am not talking about planning, because you have certainly given us full and complete answers on those questions.

Is it not a virtual impossibility to train operating personnel, devise operating standards and procedures and obtain performance experience from a machine that remains on the drawing board?

Mr. DUNNING. Well, it is difficult to say where. Your information and your education is never ending, Mr. Murray. It comes from the drawing board, and it gets greater in measure, I guess, as the prototypes are built and bigger reactors are built.

Mr. JAMES C. MURRAY. What about the operating personnel?

Mr. DUNNING. Again, I hate to repeat it, but this is a bit involved, too. It is a highly technical field, and it takes a lot of study.

URGENCY OF LEARNING TO BUILD AND OPERATE ATOMIC POWERPLANTS

Mr. JAMES C. MURRAY. Can the United States, Mr. Dunning, afford to delay the construction and operating phase of our reactor program to the extent that other nations outstrip us in the acquisition of practical aspects of production and operation know-how?

Mr. DUNNING. Do you mean can the United States afford to wait?

Mr. JAMES C. MURRAY. Can we afford to wait in the construction and operation phase of a nuclear program that includes the generation of electrical energy for consumers until someone else—or to the extent that another nation does it, and thereby acquires the practical aspects of production and operation know-how?

Mr. DUNNING. Well, Mr. Murray, it may be presumptuous for me to even try to answer that, as just a citizen of the United States, but because I am a witness here I guess I should say this:

I think we should not, and I think we are not doing that. As a citizen of the United States, with a very minute amount of knowledge about this program, although it may be more than the average layman, but what I know would indicate that we are not doing that, and I surely do not think we should do it.

Mr. JAMES C. MURRAY. Is it not true that in the absence of large subsidies from the Federal Government an investor-owned utility com-

pany cannot feasibly build a reactor until its operation is competitive with conventional fuel generation?

Mr. DUNNING. It is being done, sir.

Mr. JAMES C. MURRAY. Where is it being done, sir?

Mr. DUNNING. In New York City by Consolidated Edison.

Mr. JAMES C. MURRAY. What are they doing it with?

Mr. DUNNING. Their own dollars.

Mr. JAMES C. MURRAY. Without any subsidies whatsoever?

Mr. DUNNING. So far as I know; yes, sir.

Mr. JAMES C. MURRAY. By "subsidy" I am including tax benefits that are granted merely because they are in the field of nuclear energy.

Mr. DUNNING. I cannot answer your question outright on that, Mr. Murray, and I wish to record that fact, but it was my understanding that the plant that Consolidated Edison is building is being constructed entirely with their own finances.

Mr. SCHEETZ. Mr. Murray, if I might just interject: Of course, anyone would have to recognize that if rapid depreciation or some kind of write-off is going to be allowed for tax purposes, you have indirect subsidies just as you have in rapid amortization and, of course, one would have to concede that as a matter of arithmetic.

Mr. JAMES C. MURRAY. The point I was driving at is this: In order to generate risk capital in this area there has to be some incentive. I was asking Mr. Dunning's opinion as to whether or not we do not have to give the risk capital some incentive either by way of tax or direct subsidy?

Mr. SCHEETZ. May I add that of course that is in the pattern of what is being done in many other industries and is not peculiar to this situation.

Mr. JAMES C. MURRAY. I understand that.

Mr. SCHEETZ. That is, except as a matter of degree, perhaps.

Mr. JAMES C. MURRAY. I did not intend to confuse the matter.

Mr. SCHEETZ. I just wanted to be sure that the question was kept in context.

INTERPRETATION OF THE ADVERTISEMENT

Mr. JAMES C. MURRAY. Is it not the implication of the advertisement that at present nuclear generation of power is not competitive?

Mr. DUNNING. With power generated from our fossil fuels? Is that what you mean?

Mr. JAMES C. MURRAY. That is correct.

Mr. DUNNING. Surely.

Mr. JAMES C. MURRAY. That is not competitive?

Mr. DUNNING. No, sir.

Mr. JAMES C. MURRAY. Then how do you come to the conclusion or the anticipation in your advertisement that the investor-owned utility companies will go forward with a full scale reactor development program when they are engaged in a competitive business?

Mr. DUNNING. Well, one thing my clients asked me to leave out of this ad was any "breast beating." They did not want any over-claiming on the part of the performance of the light and power companies. The fact that seven groups of them have gone ahead and have pledged themselves to do a job that is going to cost them a lot of money is to their great credit, and I think the public will regard it so. If it were

done purely on the basis of "can we make money on this immediately?" I do not think they would do it.

They have a broader-gauged and a more public-spirited attitude than that.

Mr. JAMES C. MURRAY. Do you feel that the private utility companies that you represent in your ad would go ahead with this program even if the foreseeable future of the program was that they could not produce nuclear generation of power on a competitive basis?

Mr. DUNNING. They want to find out. They anticipate the time when our fossil fuels will not be so plentiful as they are now. They are obligated by their duty to America to make sure that we have adequate supplies of electricity.

Mr. JAMES C. MURRAY. In the event the private utilities fail, then in what way in your opinion can the United States obtain the practical techniques of power reactor operation and production in order to keep ahead in the atomic electric power field?

Mr. DUNNING. I do not know that your question is a proper one for me to even try to answer.

Mr. JAMES C. MURRAY. If you do not feel, Mr. Dunning, that you are qualified to answer, I certainly respect your right to say so.

Mr. DUNNING. I do not think that is a proper question for me to try to answer, sir.

Mr. JAMES C. MURRAY. As a citizen of the United States, knowing what you do—and you have a great deal more knowledge than the average citizen concerning this subject—if you were met with the situation where the private utility companies were not or could not produce, how else would you proceed if it were necessary to maintain the country's lead in the field?

Mr. SCHEETZ. Mr. Murray, before he answers that, of course, we take the view that we are glad to answer any of these questions——

Mr. JAMES C. MURRAY. If you would rather he did not answer the question, I will withdraw it.

Mr. SCHEETZ. I will tell you why I would not: He is here in a responsive capacity in connection with an ad which his company developed. His personal opinions and judgments as to what is going to happen in this field might be of value, but I think you can see we are here for a special purpose, and I just prefer that his personal views be left out of this. I do not know what he thinks about it.

Mr. JAMES C. MURRAY. I will withdraw the question.

IMPORTANCE OF THE INDIVIDUAL

Mr. JENSEN. When the Atomic Energy Commission representatives were before the committee, they presented us with charts showing nine different nuclear power reactors that they were attempting to develop. They talked a little about each one of them, and they finally cited one that they thought had great possibilities. Now, of course, the Atomic Energy Commission is striving, as I am sure the private utilities are, to develop a reactor and a method by which electric power can be developed that will eventually be as cheap or cheaper than the conventional methods of producing electric energy.

For anyone to attempt today, regardless of who they might be, to say today what one of these methods is finally going to prove to be

the best and the most efficient and the most economical is, of course, an impossibility. The human mind cannot envision at this time which one of these methods is going to be the best. That is what they are working on today. The Atomic Energy Commission is working already in that field, and the private scientists are working on it in that field also.

They are working together, hand in glove, and so far as I know and am concerned personally, and I believe the majority of the committee feels the same way, and the majority of the American people, they are satisfied with the progress that is being made, while we in America, of course, are never satisfied and we never want to be satisfied.

It is a good thing, Mr. Chairman, that we are not, because that is what made America great. We just want to go forward and create a better mousetrap, so to speak, and as the old saying goes, if you create a better mousetrap, the world will beat a path to your door.

Well, the world is beating a path to our door. There is not a person in the world, and I have been all over the world, pretty well, that would not like to come to this blessed America of ours with all of its faults, and I thank God every day that my father and mother left their homeland and came to America, and because of that I am an American.

We know that America was built on free, private enterprise, and our Constitution puts great emphasis on the individual. It says in effect "You take care of yourself and your family, and then the combined strength of these 52 million families or sovereign governments of ours, Ma, Pa, and the kids, will continue to keep and make America stronger and better and finer.

So, all I can say is that I am happy that we have men like you, men with vision and men like great industrialists who go forward on their own account and with their own power, and work for a greater and better and finer America.

Mr. DUNNING. Thank you very much, sir.

ELECTRIC UTILITIES PART IN EXPERIMENTAL PROGRAMS

Mr. JAMES C. MURRAY. In view of the fact that public utility companies are under regulations by the State in connection with new investments, do you think that the electric utilities represent the kind of private developmental enterprise which normally undertakes investments in experimental technological programs which will keep America in the lead in the development of new industrial era?

Mr. DUNNING. Definitely so. There is evidence of it right here.

Mr. JAMES C. MURRAY. Is it rather not the function of electric equipment companies, metallurgical companies, and other companies that must develop the equipment on a production basis to select the utilities?

Mr. SCHEETZ. Mr. Murray, we are getting off in the field of the economic philosophy of the United States, and I am wondering how relevant that is to this inquiry.

Mr. JAMES C. MURRAY. Not unless the ad has any relevancy to the economic philosophy of the United States, it has none.

Mr. SCHEETZ. You are asking this witness whether he thinks that some other group is better suited to do it. Again, that would be a

personal opinion, on his part, and as I understand it, he was called on to testify as to the accuracy of this advertisement and where he obtained the information on which it was based.

Mr. JAMES C. MURRAY. I think that you have answered most of my questions now, Mr. Dunning, and I certainly appreciate your kindness.

Mr. EVINS. Mr. Chairman, I have just a few questions.

I think you have covered most of the points, but I have been very much interested in this subject, and wrote out a few questions of my own.

PURPOSE OF ADVERTISING PROGRAM

You have covered the point as to whether this ad appeared the day that the Atomic Energy Commission appropriations hearing, were inaugurated, and I think we have received a good explanation of that to the effect that the matter was prepared well in advance.

I do think when the Chairman of the House-Senate Joint Atomic Energy Committee and a Senator who is a member of the Joint Committee make statements on the floor of the United States Senate that this ad is false and is misleading, and does not give an accurate and true picture, that it is a matter for which your advertising agency should give great attention in the preparation of future advertisements. (Referring to page 9181, et seq., of the Congressional Record of June 13, 1956.)

Mr. Dunning, did your clients tell you the purpose for this advertising campaign?

Mr. DUNNING. Yes.

Mr. EVINS. I did not get it quite clear as to what was the purpose of it.

Mr. DUNNING. The purpose of this particular advertisement or our whole campaign, sir?

Mr. EVINS. Yes.

Mr. DUNNING. The whole campaign, or this particular advertisement?

Mr. EVINS. Tell us first the purpose of your whole campaign, and then tell us specifically the purpose of this ad if you were so advised by your clients.

Mr. DUNNING. Thank you, sir.

We believe in the use of advertising, and modern business does, too. Advertising is a tool of management, in our judgment, and management can use it to further their business. In this case a regulated industry needs as much friendship and understanding as they can possibly get. Unfortunately, you cannot always get the facts on the basis of service. Maybe 90 percent of it is service. You have to deliver supreme service but approximately 10 percent is telling them about it in someway or other.

Mr. EVINS. The purpose of the overall program, then, is good will for the industry?

Mr. DUNNING. Yes, sir.

Mr. EVINS. What is the purpose of this add, specifically?

Mr. DUNNING. We happen to know, sir, that atomic energy and its promise for peace-time use is a matter of great interest to the general public, and to the Nation. Here is a service industry closely aligned in every walk of life, and they want to keep for public, their customers,

their employees, their stockholders and their prospective stockholders informed of their alertness, and their willingness to be out front, and they will not drag their feet on the matter of the development of electric power from the atom.

Mr. EVINS. Would it not be better from the standpoint of the stockholders' point of view if they did not spend so much money for advertising, so that probably they could make greater profits and pay greater dividends?

Mr. DUNNING. That would have to be a decision to be made by the management, Mr. Evins.

Mr. EVINS. Of course, I understand you as an advertising man, would be interested in acquiring all the advertising business you could.

Mr. DUNNING. Mr. Evins, I must comment on that. We have a pretty good reputation in our firm, and we have turned down a lot of business that we could have gotten, but we turned it down, first of all, because we did not believe in it, and secondly, we felt that the advertising purposes were unfair or insecure, or whatnot. We have many records of telling people not to advertise.

Mr. EVINS. I understand that you have an old and reliable firm, but you are not unlike a lawyer because I am sure you prefer the better paying clients, no doubt.

Mr. DUNNING. Yes, sir.

Mr. EVINS. Mr. Dunning, did your clients instruct you as to what areas or classes of people the advertisement was supposed to influence?

Mr. DUNNING. No, sir.

Mr. EVINS. Did they leave it up to you to select the areas in which the ads were to be run?

Mr. DUNNING. Yes, sir.

Mr. EVINS. I believe you told us who prepared the copy—that it was your own material submitted to you directly by the Edison Electric Institute?

Mr. DUNNING. Yes, sir.

ACCURACY OF THE ADVERTISEMENT

Mr. EVINS. You have also said that your agency does not check every point of accuracy and the truth of the advertisement which you placed?

Mr. DUNNING. I think that is an unfortunate inference. If we believe our clients and we know how accurate and statistically sound they are, it would be a futile and even a foolish investment of our time and money to try to repeat their own research, even if we could, sir.

We are not engineers, nor scientists.

FUTURE ADVERTISING PLANS

Mr. EVINS. If there are to be future advertisements along this line, I suppose you could not tell us at this time where they are to appear?

Mr. DUNNING. I have not any idea where they would appear, or when, Mr. Evins.

Mr. EVINS. Or the text of what the future advertisements might be?

Mr. DUNNING. I would say that there is a good reason for a future advertisement when we can announce the names of the task force, which will be history-making in the industry. When that task force personnel is announced, it will implement the promise we make to the people that we are going to do it, and I think it might be the subject of another good-will ad.

Mr. EVINS. You know, Mr. Dunning, in the practice of law there is an old maxim that states that a lawyer asks one too many questions, but I will ask you the next one:

ADVERTISEMENTS PERTAINING TO PUBLIC POWER

Have you ever placed any advertisements for your organization in opposition to the Tennessee Valley Authority?

Mr. DUNNING. Well, Mr. Evins, if you will do me the honor to read some of the advertisements we put in magazines for the Electric Companies' Advertising Program, your question can be readily answered there, sir.

Mr. EVINS. You think the answer is in the affirmative?

Mr. DUNNING. Yes, sir.

Mr. EVINS. Also, have you run any advertisements for your clients with respect to the Dixon-Yates matter?

Mr. JENSEN. Mr. Evins, your questions have no relevancy to this hearing.

Mr. EVINS. Just let the gentleman answer my question:

Also, did you run any advertisements for your clients with respect to opposition or favor for the Dixon-Yates controversy that was before the Congress?

Mr. DUNNING. No, sir. It has no bearing on this ad, but we did not do it.

Mr. EVINS. Not on this ad, but in your experience it was not your organization that ran the advertisements either favoring or opposing the Dixon-Yates matter which was fought out in the Congress and canceled by the President?

Mr. DUNNING. The Electric Companies' Advertising Program ran no advertisements on the Dixon-Yates matter whatever.

Mr. EVINS. I believe you said that your organization is a nebulous sort of a group that just meets occasionally, and lets one set the policy and the others follow. Is that substantially correct?

Mr. DUNNING. Yes, sir.

Mr. SCHEETZ. Mr. Evins, that has nothing to do with the advertising, and I trust that your question takes that into consideraion.

Mr. EVINS. There is one other matter that has concerned me for some time.

INDIRECT ADVERTISING

I have seen news articles appearing in country magazines, sometimes syndicated, by ministers of the Gospel that go back into the hills and other sections going into great detail with much information about the power programs when, seemingly, you would not expect ministers and others would be so well informed as to write on those subjects, or would have any too great concern to write on them.

Could you tell the committee from your knowledge whether or not your clients or any private power people employ advertising through that means?

Mr. SHEETZ. Mr. Chairman, if we get into that subject——

Mr. EVINS. I am just asking for a matter of information which I have been seeking to acquire for some time.

Mr. DUNNING. Maybe my counsel would advise me not to answer you, but I am glad to answer you anyway.

Mr. SCHEETZ. I would not advise you not to answer it, but I think the question is so far afield that it has no relevancy to this matter under consideration.

Mr. EVINS. I said I was asking it as a matter of information.

Mr. DUNNING. Let me say first that N. W. Ayer does not. Whether any of our clients use any publicity service of that sort I do not know. Neither do I know how Tennessee Valley does it.

Mr. EVINS. Well, I have received some information from my area since this ad appeared and apparently these people misconstrued it as misleading and not accurate on the basis of the information which they have on the subject, and that was the reason for my concern.

I have one further question, Mr. Chairman.

Mr. JENSEN. Would the gentleman put the letters in the record?

Mr. EVINS. I have the substance of my questions in the record.

Mr. JENSEN. I mean the letters from your district.

GENESIS OF THE ADVERTISEMENT

Mr. EVINS. The gentleman stated he attended this conference in which the private power people were there, and outlined their program for advertising this public appeal and public relations program on which they were about to embark.

Could the gentleman tell us whether or not there were any represenatives of the Atomic Energy Commission present at that meeting, or any other Government agency, to your knowledge?

Mr. DUNNING. To my knowledge there were none, sir. Would you support me on that, Van?

Mr. VAN METER. There were none.

Mr. EVINS. Off the record.

(Discussion off the record.)

Mr. DUNNING. Mr. Evins, I talked about a management group meeting in Atlantic City. There may have been attendants from God knows what at the convention. They may have come to the convention, but I am referring to our electric companies' advertising program meeting. There were none there.

INTERPRETATION OF ADVERTISEMENT

Mr. EVINS. Mr. Dunning, as an expert in ad writing, when you use bold headlines and when you enlarge your figures and magnify them, I am sure you know by experience that people do not go into detail and read all of the explanations. As has been emphasized, when you state "built or planned", that gives a very wide field in which you could use probably any number of figures if you want to. I am sure that there are others planned in the minds of a lot of people.

Mr. DUNNING. As far as we know they have not gotten to the state where we would regard them as "planned," whereby a board of directors ordered it done, and compilations are started.

Mr. EVINS. They are planned in the minds of those who introduced probably legislation in the Congress, and committees have considered the matter.

When you say "constructed or planned," it gives you a wide latitude for the use of figures, which I submit is subject to misinterpretation.

Mr. DUNNING. You have the privilege, sir, of considering these statistical facts anyway you wish, of course, Mr. Evins. As far as we know, they are extremely accurate and honest.

Mr. HAND. At least they showed good judgment in selecting Atlantic City, did they not?

Mr. EVINS. I am always pleased and delighted to applaud Atlantic City. I only wish the gentleman would sometimes applaud my State.

ACCURACY OF ADVERTISEMENT

Mr. JENSEN. The gentleman from Tennessee [Mr. Evins] has made some very categorical statements that certain Members of the other Body and Members of this Body have said on the Floor of the other Body and of the House that the figures as here presented in this ad in question by the American Independent Electric Light and Power Companies were erroneous and false. Well, now, just because that was said on the Floor of the Congress of the United States does not necessarily make it a fact; because every once in a while there are misstatements made on the Floor of both Houses, as the gentleman from Tennessee [Mr. Evins] well knows. And I think this is a clear example of misstatements by honorable Members of Congress.

Mr. EVINS. Well the gentleman would agree that this committee is in a position to have certain information about a project and also that Senator Anderson, Chairman of the Joint Committee, and Senator Gore, a member of the Joint Committee, would also be in a position to have a certain understanding of the matter?

Mr. JENSEN. I did not mention any Member of either House; I made a flat statement as a statement of fact.

Mr. EVINS. I will agree that sometimes misstatements are made; but I was referring to the statement the Senator from New Mexico as the Chairman of the Joint Committee made to the effect the ad is misleading and false.

Mr. JENSEN. I will let your statement stand as you care to have it, and I will let my statement stand.

Mr. EVINS. I want to ask 1 or 2 more questions.

MAGAZINES USED FOR ADVERTISING

The gentleman stated the figures about newspaper advertising that was under way and mentioned that there were 31 magazines in which this institute, or combination, or organization inserts advertising.

Will you supply for the record the names of those magazines?

Mr. DUNNING. I do not have them today, but I will send them to your clerk, or to the Chairman.

Mr. EVINS. I think it is important, because that ties in somewhat with my earlier question about advertising that would reach into certain sections.

Mr. RABAUT. Send it to the Chairman of the House Appropriations Committee.

Mr. SCHEETZ. I want to be sure I understand the question. I believe sometimes advertisements go in one magazine and sometimes in another. I suppose one group is used more often than another, but I am not sure.

Mr. DUNNING. We have a regular list and I presume that is what Mr. Evins wants.

Mr. EVINS. Yes; I notice some of your advertisements more frequently appear in certain regions of the country.

Mr. DUNNING. Yes, sir.

Mr. EVINS. That is the type of advertisement, or the list of magazines that I think you could give us, if you will, please.

(The material referred to follows:)

MAGAZINE SCHEDULE, ELECTRIC COMPANIES ADVERTISING PROGRAM

Saturday Evening Post	Farm Journal
Collier's	Capper's Farmer
Life	Farm & Ranch
Look	Progressive Farmer
American	Successful Farming
Redbook	Editor & Publisher
Reader's Digest	Publisher's Auxiliary
Coronet	American Press
American Legion	Broadcasting-Telecasting
Saturday Review of Literature	Quill
Atlantic	Town Journal
Harpers	Grit
U. S. News & World Report	Scholastic Magazine
Time	Young Catholic Messenger
Newsweek	Scholastic Roto

Mr. JAMES C. MURRAY. Are there any further questions?

COST OF ADVERTISING

Mr. EVINS. The gentleman in testifying earlier used to phrase "at constantly decreasing cost to the consumer." You used the language "at constantly decreasing cost." If the extensive advertising campaign was not made, if the money was not expended, the current might be brought to the people at a still decreasing rate; because, as we all know, all expenditures go into the rate base upon which power rates are made to the consumers.

Is that not right?

Mr. RABAUT. My friend is forgetting that the gentleman before the committee [Mr. Dunning] is in the advertising business.

Mr. EVINS. No; but the gentleman referred to that and I also wanted to refer to it. That happened to be his own statement.

Mr. JAMES C. MURRAY. I am certain the gentleman can find many reasons for people wanting to advertise.

Are there any further questions?

CLEMENTINE PROJECT

Mr. EVINS. In addition to the project which we referred to earlier and on which legislation has been introduced, there is reference to the Clementine project. Is that included in your list of the 89 or 90?

Mr. DUNNING. I do not recognize it by that name.

Mr. EVINS. It has long been destroyed.

Mr. DUNNING. I do not recognize it by that name. I will give you some other funny names, though, if you want them.

Mr. EVINS. Well, objection was made to the effort to include all projects possible.

Mr. JAMES C. MURRAY. That was included—the Los Alamos Fast Clementine.

Mr. DUNNING. Yes; that was included.

Mr. EVINS. That has been blown up and exploded. Is that included in one of those under construction and planned?

Mr. DUNNING. No, sir.

Mr. JAMES C. MURRAY. That is one included in the 55 figure.

Mr. EVINS. That is one that was constructed and planned?

Mr. DUNNING. And was destroyed. And do you know why they destroyed it? I am sure you do.

Mr. EVINS. It was for experimental purposes?

Mr. DUNNING. Yes, sir. They learned something from it.

Mr. EVINS. But it might lead someone to believe that you had 55 built or on the way, and it is one that has long been destroyed; but that adds up in exaggerating the figures.

Mr. JAMES C. MURRAY. Are there any further questions?

RIGHT TO ADVERTISE

Mr. JENSEN. I did not know there was any law against any person or persons or concerns advertising in any magazine or paper in America.

Mr. JAMES C. MURRAY. There is no law against a merchant puffing his wares. That is one of his historic rights.

Mr. JENSEN. I do not object, even, to seeing the State of Tennessee advertising "Come to the Tennessee Valley with your industries and take advantage of the cheap power."

Mr. EVINS. I thought my questions might excite that; that is the reason I prefaced my remarks that "Sometimes you ask one too many questions." I thought it might excite questions.

Mr. JENSEN. Yes. The only thing I objected to was that since the taxpayers of my district, the people that I represent, helped to pay the bill to establish TVA, I did not think it was quite fair to try to get the industries of my State to move down there and take advantage of that tax-free cheap power.

Mr. EVINS. The purpose of my question, I will say to the gentleman, is not that it is illegal to make the advertisement, but it is to show the volume and extent of it.

Mr. JENSEN. After all, America is a pretty big place and if we can make it bigger and better by some of this private enterprise, I am not going to hinder it in any way, shape or form.

Mr. EVINS. That is all.

Mr. JAMES C. MURRAY. Are there any further questions? The witness has been here all of the afternoon, and it is late in the afternoon.

LAUDATORY COMMENT ON HANDLING OF THE INQUIRY BY CONGRESSMAN MURRAY

Mr. HAND. Let me make the comment that I think the Chair [Mr. Murray] has conducted this hearing very fairly and I think the meeting has been quite amicable. I will ask no questions; because, despite those kind remarks, I consider the hearing has been completely irrelevant to the legislative purposes of this committee.

Mr. JAMES C. MURRAY. Thank you for the kind remarks. I disagree with the criticism of the relevancy.

Mr. HAND. It is not meant as a criticism as far as you are concerned.

CONCERNING STATEMENTS TO PRESS AS TO TESTIMONY

Mr. SCHEETZ. May I ask as a matter of protocol: I understand this is in executive session. We have no desire to make any statement to the papers, but I do know that the newspaper men are outside waiting to find out. Am I correct in assuming that this committee makes no public statement about the testimony and that this testimony, if released, will be released in its entirety at a certain time?

Mr. JAMES C. MURRAY. Yes; that is correct.

Mr. SCHEETZ. I presume you will say to the gentlemen waiting outside "We have no comment." On the other hand, you can readily understand, if it should appear that public statements were made, we would then feel justified in making such statement as we thought appropriate, without a violation of protocol.

Mr. RABAUT. That is right.

Mr. SCHEETZ. We do not want to be in that position. On the other hand, we have on occasion seen comments which have been somewhat derogatory of ourselves and, in those circumstances, I think we should exercise our rights as citizens.

Mr. JAMES C. MURRAY. I believe your understanding is correct.

(Discussion off the record.)

Mr. JAMES C. MURRAY. The transcript will be made available to you, so that you can make it reflect what you actually meant.

Mr. DUNNING. Here, or in New York?

Mr. JAMES C. MURRAY. Here. We do not mail it to you. As a matter of fact, you can see the transcript tomorrow morning at 10:00 o'clock at room P–3.

Mr. DUNNING. And, if not tomorrow, Monday?

Mr. JAMES C. MURRAY. If not tomorrow, Monday.

On behalf of the committee, Mr. Dunning, I would like to express our appreciation for your kindness in coming here by invitation and your complete cooperation with the committee insofar as its questions were concerned.

Mr. DUNNING. Thank you very much, Mr. Murray, and the committee, too. It was my initial effort and it has been quite an experience and a pleasing one.

Mr. JAMES C. MURRAY. I might say you have been very helpful.

Mr. DUNNING. Thank you, indeed.

(Whereupon, the committee recessed until 10 a. m., Tuesday, July 3, 1956.)

TUESDAY, JULY 3, 1956.

WITNESSES

ATOMIC ENERGY COMMISSION

LEWIS L. STRAUSS, CHAIRMAN
THOMAS E. MURRAY, COMMISSIONER
WILLARD F. LIBBY, COMMISSIONER
HAROLD S. VANCE, COMMISSIONER
K. E. FIELDS, GENERAL MANAGER
WILLIAM MITCHELL, GENERAL COUNSEL
W. K. DAVIS, DIRECTOR, DIVISION OF REACTOR DEVELOPMENT

EXPLOSION AT NEW YORK PLANT

Chairman CANNON. The committee will be in order.

Admiral Strauss, the United Press reports this morning that 2 explosions of radioactive thorium wrecked an atomic energy laboratory yesterday, injuring 9 persons and routing 200 workers in panic, and that several policemen and firemen received mild doses of radiation and nearly 300 other persons were endangered.

It is said elsewhere that it was not a nuclear explosion but an explosion of thorium.

What is the difference between a nuclear explosion and a thorium explosion? We have understood that either thorium or uranium could be used and is being used in your work.

Mr. STRAUSS. In the first place, Mr. Chairman, this plant was not an Atomic Energy Commission laboratory. If the report to which you refer makes that statement, it is in error.

(NOTE.—The report did not state that it was a laboratory of the Atomic Energy Commission, but rather that it was an atomic energy laboratory.)

The explosion occurred in a laboratory of the Sylvania Electric Products Company, which was engaged in contract work for the Commission, using thorium and zircorium metals. While we do not have anything like complete information concerning the accident, it appears that the explosion was due to a chemical reaction, namely, the combustion of finely divided powdered material with the oxygen in the atmosphere. We believe that to be the fact. We do not know. The zirconium is not radioactive, and thorium is only mildly radioactive by comparison with uranium. We believe that there was some contamination inside of the building, perhaps from the thorium. We expect to have further details on it later in the day. It was not a nuclear accident in the sense indicated by the scare headlines. It was an industrial accident such as unfortunately happens when finely divided material, even the dust in grain elevators and coal mines, sometimes explode.

This is our present belief based on incomplete and inadequate information.

Chairman CANNON. With the limited information at hand could you say whether this was or might have been an avoidable accident? Was it the nature of the unpredictable material with which you are dealing or would you say it was possibly due to negligence?

Mr. STRAUSS. I do not have any information on which I can answer that question at this time.

Chairman CANNON. Have you any general supervision over atomic energy research in private plants in the United States? I understand this is a private plant.

Mr. STRAUSS. This is a private plant and these two materials are unclassified materials, information on which is in the public domain. There is no law against owning and using zirconium or thorium. Anyone who wants to experiment with these materials, according to my best knowledge and belief, can do so. He takes the same responsibility that anyone else does, under the law, for running a safe establishment.

The Sylvania Company is a large, successful and reputable company. However, accidents frequently occur under the best regulated circumstances.

The explosion is regrettable but completely understandable from that point of view.

Chairman CANNON. Has this company ever bid on contracts or applied for contracts for work in which you are engaged?

Mr. STRAUSS. They are, as I have said, presently a contractor doing work for the Commission.

Chairman CANNON. Have they ever bid or applied for contracts?

Mr. STRAUSS. I do not know whether in the present contract they approached us or we approached them. Sometimes it is one way, Mr. Cannon, sometimes the other. I would have to look into the history of that particular contract, to give the exact answer.

For example, in the case of the Savannah River plant operated by the duPont Company, the Commission approached the duPont Company and besought them to undertake it. There are other situations where the reverse procedure is followed.

Chairman CANNON. The real menace here is the fact that the public generally has been subjected to the influence of radioactive material.

Mr. STRAUSS. In connection with this accident?

Chairman CANNON. Yes.

Mr. STRAUSS. I do not believe that is so.

Chairman CANNON. Of course, we have nothing but the report carried in the newspaper account. The newspaper says several policemen and firemen received mild doses of radiation and nearly 300 other persons were endangered. Now, by endangered, they could not mean anything else but being subjected to the influence of radioactivity.

Mr. STRAUSS. I think they could. This was an explosion, and an explosion which was followed by shock waves and which moved window frames and window glass may endanger people. It may not necessarily have anything to do with radiation.

Chairman CANNON. That is not the purport of the account before us.

Mr. STRAUSS. I do not want to debate the account in the newspaper without knowledge of the facts.

Chairman CANNON. Have you been consulted about this? Have you received any information?

Mr. STRAUSS. We have received information substantially as I have given it to you. Our people on the site in New York are now engaged in making a detailed examination and investigation and will report to us in detail.

Chairman CANNON. Those are members of your staff; the members of your staff are now so engaged?

Mr. STRAUSS. Yes, sir, we have an office in New York within a few miles of this particular site and they were on the premises, I suppose, within minutes.

Mr. FIELDS. They made a radiation survey yesterday, sir.

Mr. STRAUSS. What was the result of the survey?

Mr. FIELDS. The result of that is that there was no significant radiation outside the building and the radiation levels within the building, at the time of the survey yesterday afternoon, were not higher than those normally found in such an operating area.

Chairman CANNON. My fear had been that under similar conditions in a more acute manifestation, there might have been a development of radioactivity outside the building. You say in this case it was confined to the building.

Is it possible, that under like circumstances, it could have been outside the building?

Mr. FIELDS. I do not see how. In this particular operation, it could not have been very widespread at all.

Chairman CANNON. You have not answered the question.

Could it have been outside the building?

Mr. FIELDS. The radiation could have extended outside the building for only very short distances, due to the force of the chemical explosion blowing out some of the thorium particles.

NEWSPAPER COVERAGE OF EXPLOSION

Chairman CANNON. Evidently from this newspaper report newsmen on the scene were not given as full information as they might have wished, because the United Press story goes on to say that the Sylvania Corporation's atomic division is under contract to the Atomic Energy Commission, and that: "AEC, state and local officials immediately began decontamination operations under tight security conditions."

Why was it necessary to classify this to the extent that they applied tight security conditions?

Mr. STRAUSS. Mr. Chairman, if classified work was going on in a plant, that is to say, secret components were being made, and an explosion occurred, would you advocate inviting the press in and compromising the security?

Chairman CANNON. I am asking you. What is your answer?

Mr. STRAUSS. My answer is this: If classified work was going on in this plant, then that statement regarding security would be justified. But, as I have told you, I have not seen the statement. There is nothing official about it, and to question me about a statement in a newspaper on a subject on which a detailed report has not been made to the Commission is, I think, not likely to get you the information you are seeking. I will be glad to provide you such information as soon as I have a report. I will furnish you a complete and detailed report.

Chairman CANNON. In the meantime, there is no question, although you say it is a newspaper statement, there is no question that tight security conditions were applied?

Mr. STRAUSS. I do not know.

Chairman CANNON. Apparently you do not care to express an opinion at this time, but unequivocal statements are made here that tight security conditions were applied. I think we could give that statement every credence.

Mr. PHILLIPS. What paper was it from?

Chairman CANNON. This was in this morning's Washington Post and Times Herald.

Mr. PHILLIPS. Do you still assert, then, that we should give full credence to it?

Chairman CANNON. I beg your pardon?

Mr. PHILLIPS. Do you still assert that we should give full credence to it?

Chairman CANNON. Unquestionably. I can not imagine the United Press distributing a report that tight security conditions were applied when that was not true.

Mr. PHILLIPS. My question was only directed to the fact that newspaper reports, after any explosion or any accident, airplane accident or whatever they may be, are the first impressions of the reporters who talked to people there and quite often are modified by subsequent investigation.

INSURANCE

Chairman CANNON. That is quite possible, but these are not mere impressions. The reporters were denied information or they would not have made such a statement. However, it takes us back to the question which we have just been discussing; the question of insurance. Did this company or any one connected with this company have insurance against such contingencies?

Mr. STRAUSS. I would think, as prudent industrialists, they did and they would have no difficulty obtaining insurance for this type of industrial accident.

Chairman CANNON. In any amount?

Mr. STRAUSS. Well, I cannot answer as to the amount but I am sure that they can obtain insurance within any reasonable prudent amount. This, in my opinion, is the type of industrial accident for which insurance can be obtained.

Your question, Mr. Chairman, about insurance, indicates that you may be under the misapprehension that this was a reactor or that it had some bearing on a contract for a reactor. The contract did not have anything to do with the construction of a reactor although work was going on there in connection with fuel elements for reactors for other people, including military installations. And, therefore, if security regulations were invoked for that reason it would be quite appropriate.

Chairman CANNON. It is rather significant that Health Department officials said rubber coats, helmets, and boots of 40 firemen who fought the blaze set off by the explosion had been contaminated and were discarded immediately.

AUTHORIZATION FOR APPROPRIATIONS FOR CONSTRUCTION OF REACTORS

I would like to read from a letter which appears in the hearing before the Joint Committee on Atomic Energy under date of May 23, 1956——

Mr. STRAUSS. From what page are you reading, Mr. Chairman?

Chairman CANNON. Page 67. The letter is addressed to Hon. Clinton P. Anderson, Chairman of the Joint Committee on Atomic Energy, and is signed by W. F. Libby, Acting Chairman of the Atomic Energy Commission. I will quote a paragraph from page 68:

Finally, we point out that no substantive legislation is necessary to authorize the Commission to construct full-scale demonstration reactors. Section 31a (4)

of the Atomic Energy Act of 1954 authorizes the Commission to engage in research and development activities relating to "the generation of usable energy, and the demonstration of the practical value of utilization and production facilities for industrial or commercial purposes." The report of the managers for the House, accompanying the conference report on the Atomic Energy Act of 1954, states that this language was intended "to clarify the authority of the Commission to build or to contract for the building of large-scale atomic energy utilization facilities for the purpose of demonstrating the practical value of such facilities in the generation of electricity." Colloquies occurring in the Senate on the conference report disclose a similar understanding. Accordingly, the bills would not add to the Commission's substantive authority. They would rather direct the Commission to exercise its existing authority under section 31 by constructing six plants of the character and location indicated, and would authorize necessary appropriations for that purpose.

Mr. JENSEN. Mr. Chairman, I notice your clerk gives copies of the hearings to members on the other side of the table. I wonder if one of our clerks would get copies of the hearings for this side of the table?

Mr. PHILLIPS. What hearings are these, please?

Chairman CANNON. Your side of the table, Mr. Jensen, has the book in front of you at this minute.

Mr. JENSEN. I do not have one just this minute.

Mr. PHILLIPS. I have one because it is a marked copy, it has some material in it that I think should be put in the record. But I do not believe there was any other.

Mr. JENSEN. If this is a one-sided deal, we want to know it.

Chairman CANNON. Just a minute. Let me ask you, Mr. Phillips: Do you have a copy of the hearings before the Joint Committee on Atomic Energy?

Mr. PHILLIPS. If this is it, I have it. I think I am probably the only one on this side of the table who does have it.

Chairman CANNON. That is the statement I made, that you have it before you at this minute.

Mr. PHILLIPS. I have it before me.

Chairman CANNON. The clerks tell me every member was provided with a copy several days ago, immediately after the hearings were released by the Joint Committee. If anybody wants them we will provide additional copies, although they are supposed to do it themselves.

Mr. JENSEN. I notice your clerk did it for all the others on your side of the table.

Chairman CANNON. I do not think so.

Mr. JENSEN. I saw him do it.

Chairman CANNON. Well, you are entitled to have another copy if you want one.

Mr. JENSEN. I thought I was. I thought I was still a member of the committee.

Mr. BOLAND. I will be delighted to give you mine if you would like to look at it.

Mr. PHILLIPS. What page are you reading from?

Chairman CANNON. We are reading from page 68.

CHAIRMAN'S MANNER OF CONDUCTING THE HEARINGS

Mr. JENSEN. Mr. Chairman, here is a good place for me to say something. May I say something?

Chairman CANNON. The gentleman is recognized.

Mr. JENSEN. I have sat in these hearings now for quite some time, five days, as have the other members of the committee, and we have

seen abuses no end showered on Admiral Strauss and other members of the Commission and their staff to the end that I do not see how they have the patience to take it.

Now, I want to plead with you gentlemen, Admiral Strauss, and the rest of you, that I hope you will not take to heart this abuse that has been showered on you by the Chairman of this committee to the degree that you will throw up your hands and resign from the great job and the great responsibilities you have. I do not want to say that I would blame you if you did, but I will say that you have more patience and forebearance than any group of men I have ever sat across the table from in a hearing in the United States Congress, and I hope that the Chairman will cease and desist from the kind of tactics he has been employing for these five days that you good folks have been before this committee.

I am almost to the point of being ashamed of sitting on this side of the table, and I am quite sure I speak for a lot of the members of this committee.

Mr. RABAUT. Ben, you are not speaking for me.

Mr. JENSEN. That is all right. You just go ahead then and shower the abuse on these people.

Mr. RABAUT. And I am not doing that.

Mr. JENSEN. And it won't get you any place and it won't inure to the reputation of Congress nor to the great job that these men have to do. I just hope and pray that you gentlemen on the other side of the table will not take this abuse to heart to such a degree that it will hinder the great program for which you are responsible.

Now I have that off my chest, and I am through.

Chairman CANNON. Does any other member of the committee have anything to say?

Mr. RABAUT. I am informed by the clerk that there was a book on the table for every member when we started these hearings. Evidently the members took them to their offices and now there is a shortage. They are sending over for some additional books.

LETTER OF ATOMIC ENERGY COMMISSION STATING THAT AUTHORIZING LEGISLATION IS NOT NECESSARY

Chairman CANNON. If the members of the committee will turn to page 68——

Mr. PHILLIPS. May I ask the Chairman if he is putting in the record the entire letter or just quoting from it?

Chairman CANNON. For the present I am merely quoting this one paragraph. I will include the entire letter in the record.

This paragraph is taken from the official letter of the Commission to the head of the Joint Committee on Atomic Energy. Closing this letter, the last paragraph on page 71, reads:

> The Bureau of the Budget has advised us that it has no objection to our transmitting these comments and that it concurs in the conclusions expressed.

OPINION OF LEGISLATIVE COUNSEL OF THE HOUSE OF REPRESENTATIVES AS TO STATEMENTS IN THE LETTER

We submitted this matter, as is customary, to the Legislative Counsel. Under date of July 3, 1956, we have a reply.

Mr. PHILLIPS. What was the point submitted?

Chairman CANNON. The entire letter was submitted. They were asked merely to check the correctness of the conclusions expressed in the letter. I will read the response of the Legislative Counsel:

We have been asked by Mr. John Donnelly, of the staff of the Committee on Appropriations, to give you our views on the question of whether or not there is authority in existing law for the appropriation of funds to the Atomic Energy Commission for the construction of large-scale power reactor demonstration facilities of the type described in S. 4146.

The Acting Chairman of the Atomic Energy Commission, in a letter to the Chairman of the Joint Committee on Atomic Energy (dated May 18, 1956, and printed on pages 67–71 of the Joint Committee's Hearings on Proposed Legislation for Accelerating Civilian Reactor Program), expresses the view that "no substantive legislation is necessary to authorize the Commission to construct full-scale demonstration reactors"; he asserts that the facilities could be constructed under the existing provisions of section 31 of the Atomic Energy Act of 1954, which authorizes and directs the Atomic Energy Commission "to make arrangements (including contracts, agreements, and loans) for the conduct of research and development activities relating to * * * utilization of special nuclear material, atomic energy, and radioactive material and processes entailed in the utilization or production of atomic energy or such material for all other purposes, including industrial uses, the generation of usable energy, and the demonstration of the practical value of utilization or production facilities for industrial or commercial purposes."

The view expressed by the Acting Chairman of the Atomic Energy Commission is apparently based on the assumption that, since there is ample authority to construct the facilities in section 31 of the Act (as there would be also in the provisions added to the Act by S. 4146), any appropriations necessary to carry out the construction are automatically authorized. If the Acting Chairman is contending, on the basis of section 31, that there is authority in existing law for appropriations to carry out the construction as well as basic authority for the construction itself (and it is not clear to us whether that is his contention), his position reflects the normal rule as we understand it; but that rule is of course subject to limitation by express language, and we think that such a limitation exists and is controlling in this case.

Section 261 of the Atomic Energy Act of 1954, which contains provisions relating to appropriations, reads in pertinent part as follows:

"There are hereby authorized to be appropriated such sums as may be necessary and appropriate to carry out the provisions and purposes of this Act *except such as may be necessary for acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion.*" [Italic added.]

It seems to us—

Mr. PHILLIPS. Are you finishing the letter, Mr. Chairman?

Chairman CANNON. Not yet.

Mr. PHILLIPS. I want to ask again, are you putting the entire letter in or just a paragraph?

Chairman CANNON. The entire letter.

Mr. PHILLIPS. I think this entire letter should go in, too. I think it ought to go in where we are talking about it.

Chairman CANNON. It will be included.

Mr. PHILLIPS. If you will look on page 68, a very important item is omitted from the legislative counsel's opinion and that is that the attorney for the Commission also relied on the colloquies in the Senate which would give the intent of the Congress.

Chairman CANNON. That will be discussed as we proceed with the letter.

It seems to us that, although section 31 of the Atomic Energy Act of 1954—

Mr. JENSEN. Who is "us"?

Chairman CANNON. This is the Office of the Legislative Counsel and it is signed by "Allan H. Perley, Legislative Counsel."

Mr. JENSEN. For whom?

Chairman CANNON. As the legislative counsel. It is addressed to the Chairman of the Committee on Appropriations of the House of Representatives.

Mr. JENSEN. The Legislative Counsel of the House or of the Senate?

Chairman CANNON. It is the Legislative Counsel of the House.

It seems to us that, although section 31 of the Atomic Energy Act of 1954 (as well as the new provisions which would be added to that act by S. 4146) would provide basic authority for the construction of the facilities concerned, the language of section 261 (quoted above) makes it clear that there is no authority in that act for the appropriation of funds for the acquisition, construction, or expansion of such facilities. This conclusion is supported by the statement of managers accompanying the conference report on the Atomic Energy Act of 1954 (H. Rept. No. 2639, 83d Cong., 2d sess.), which states that the construction of demonstration facilities under section 31 a (4) of the Act "would require specific authorization by the Congress as provided in section 261." In this connection a few statements were made on the floor of the House and Senate—

and these are the colloquies referred to by the gentleman from California—

during the consideration of the conference report on the act; but, so far as we have been able to discover, none of these statements specifically touched upon the problem of appropriations to carry out this construction.

Accordingly, it appears to us that there is no provision in existing law (other than the provisions of Public Laws 141 and 506, discussed below, which do not apply to the facilities contemplated by S. 4146) authorizing the making of appropriations for the construction of plants or facilities under the Atomic Energy Act of 1954.

Mr. PHILLIPS. That is not entirely clear. The chairman read a plural verb and apparently the writer is referring only to one item. What is he referring to in addition to the one item?

Chairman CANNON. I merely present the letter. It speaks for itself. Counsel calls my attention to the fact that it is a singular verb, it says "there is no provision in existing law."

Mr. PHILLIPS. Thank you, sir.

Chairman CANNON (continuing):

It should be noted that legislation authorizing the appropriation of funds for the acquisition, construction, or expansion of specified plants and facilities by the Atomic Energy Commission was passed in both the first and second sessions of this Congress (Public Laws 141 and 506) before the appropriations were made. In the report of the Joint Committee on Atomic Energy on H. R. 6795 (which became Public Law 141), the following statement appeared:

"The Atomic Energy Act of 1946, which was the basic atomic control law until the passage of the Atomic Energy Act of 1954, authorized the appropriation to the Commission of 'such sums as may be necessary and appropriate to carry out the provisions and purposes of this act.'

"Under this broad and general authorization the Commission was enabled to seek appropriations for operations, equipment, plants, facilities, real estate, or any other purposes covered by the Atomic Energy Act of 1946. Such blanket authority to seek appropriations is not normal to Government activities and was given to the Atomic Energy Commission because the program in 1946 was undefined and not amenable to treatment under normal budgeting practices of the Government. Since 1946, however, the Commission's program has become more clearly defined and with almost a decade of experience it became clear to the Joint Committee that the Commission' authority to seek appropriations should be brought more in line with that obtaining in other areas of Government. Therefore, the Atomic Energy Act of 1954 modified the Commission's authority to seek appropriations [by adding the language of sec. 261 (quoted above)].

"The effect of this language as stated in the report accompanying the bill was to require the Commission 'to obtain congressional approval of new construction or expansion of its plants.'

"The bill, H. R. 6795, is the first authorizing legislation resulting from the change in the Commission's authority to seek appropriations outlined above."

In the report of the Joint Committee on H. R. 10387 (which became Public Law 506), there appeared the following statement:

"When the Atomic Energy Act of 1954 was enacted, it contained, for the first time, exceptions to the general authorization previously contained in the law. * * * This is the second annual authorization legislation to be enacted pursuant to [the portion of section 261 which is underscored as it appears in this letter]."

In summary, it seems clear to us that specific authorizing legislation (such as the provisions contained in section 4 of S. 4146) is needed before funds can be appropriated, consistently with the rules of the House, for the construction of the facilities concerned, and we would further make the observation that the practice since the enactment of the Atomic Energy Act of 1954 has been in accord with this conclusion.

Sincerely yours,

ALLAN H. PERLEY,
Legislative Counsel.

LETTER OF AEC

Chairman CANNON. I believe, Dr. Libby, you wrote the letter appearing on pages 67–71 of the Senate hearing?

Dr. LIBBY. Yes, sir, I signed the letter. As in much of our official correspondence, of course, the letters are prepared by our staff. I would ask your permission to have our general counsel answer your question, if you would allow it. It is on a legal point with which I am not very familar, I must confess.

Chairman CANNON. You are accustomed to sign letters of the Commission with which you are not familiar, which you do not fully understand?

Dr. LIBBY. I am familiar in a general way, but I am afraid this question, turns upon the meaning of the adjective "substantive." On the question of whether this was substantive legislation or not, it seems to me that what we said in our letter was true, but I am not a lawyer.

Chairman CANNON. What was your purpose in writing this letter, Dr. Libby?

Dr. LIBBY. The purpose was to comment on the Senate bill 2725 and H. R. 10805.

Chairman CANNON. That is the Gore bill and the Holifield bill?

Dr. LIBBY. The letter was in reply to a letter addressed to the Commission dated May 10th, requesting a statement of the Commission's position on those bills.

Chairman CANNON. And your position was that further legislation, the Gore bill, for example, is not necessary, that there was already authority for such appropriations?

Dr. LIBBY. May I ask the General Counsel to answer your question, sir?

AEC LETTER AND OPINION OF HOUSE LEGISLATIVE COUNSEL PRINTED IN TOTO

Mr. PHILLIPS. Mr. Chairman, would not this be a good point to put the letter and the opinion of counsel in the record so that we have it right there?

Mr. MITCHELL. Could I speak to this, Mr. Chairman?

Chairman CANNON. I did not yet get your question.

Mr. PHILLIPS. I thought it would be a good place to put this letter and our counsel's opinion in the record.

Chairman CANNON. I did not read the whole letter because much of it was not germane to this particular point. It would consume time. But the entire letter will be included in the record.

Mr. PHILLIPS. And put in also the opinion of the counsel?

Chairman CANNON. The entire correspondence, both the letter of the Commission and the letter of the counsel will be in the record.

(The letter and opinion follow:)

ATOMIC ENERGY COMMISSION,
Washington, D. C., May 18, 1956.

Hon. CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR SENATOR ANDERSON: This is in reply to your letter to me dated May 10, 1956, requesting a statement of the Atomic Energy Commission's position with respect to S. 2725 (84th Cong., 1st sess.) and H. R. 10805 (84th Cong., 2d sess.), identical bills authorizing and directing the construction by the Atomic Energy Commission of six nuclear power facilities for the production of electric power.

As we understand the provisions of the 2 bills, they would authorize and direct the Commission to construct 6 nuclear power facilities of different but promising designs, in different geographical sections of the United States where there is a need for additional electric generating capacity, for the purpose of demonstrating the practical value of nuclear utilization facilities for industrial or commercial purposes. The undertakings would be pursuant to section 31 of the Atomic Energy Act of 1954 and, as stated, would be in addition to the reactor development program being carried out by private or public groups under licenses authorized by section 103 of the Atomic Energy Act of 1954.

Prior to commenting with respect to the philosophy of the bills and the effect their enactment would have upon the Commission's power reactor development program, certain more direct comments on the bills seem to us appropriate.

First, the bills provide that the construction program "shall be in addition to the reactor development program being carried out by private or public groups under licenses authorized by section 103 of the Atomic Energy Act of 1954." It is our belief that this statutory language needs clarification. All power reactor projects now being contemplated by industry on its own or under joint AEC-industry power demonstration reactor program arrangements which will be licensed will, in fact, be licensed under section 104 of the act since none of them appears to have been sufficiently developed to warrant a Commission finding of practical value under section 102 and the issuance of a section 103 license. We assume that the construction projects authorized by the bill are intended to be in addition to these presently contemplated licensed projects. Consequently, it is our belief that the reference to section 103 in section 1 (d) of the bills should be to section 104.

Second, we cannot tell, from the language of the bills whether the six nuclear power facilities which the bills would direct the Commission to construct include presently contemplated facilities which will be constructed pursuant to section 31 of the act. As you know, the reactor portion of the plant at Shippingport will be owned by the Commission. Similarly, a portion of the consumers facility under the first round of the power demonstration reactor program and the reactor portion of the Wolverine and Elk River facilities under the second round of the power demonstration reactor program will all be owned by the Commission. All of these projects represent different promising designs which could, if the intent was to include them, fulfill two-thirds of the bill's requirements.

Finally, we point out that no substantive legislation is necessary to authorize the Commission to construct full-scale demonstration reactors. Section 31a (4) of the Atomic Energy Act of 1954 authorizes the Commission to engage in research and development activities relating to "the generation of usable energy, and the demonstration of the practical value of utilization and production facilities for industrial or commercial purposes." The report of the managers for the House, accompanying the conference report on the Atomic Energy Act of 1954, states that this language was intended "to clarify the authority of the Commission to build or to contract for the building of large-scale atomic energy utilization facilities for the purpose of demonstrating the practical value of such facilities in the gen-

eration of electricity." Colloquies occurring in the Senate on the conference report disclose a similar understanding. Accordingly, the bills would not add to the Commission's substantive authority. They would rather direct the Commission to exercise its existing authority under section 31 by constructing six plants of the character and location indicated, and would authorize necessary appropriations for that purpose.

As a general proposition, the Commission recognizes that construction of full-scale prototype nuclear powerplants is a necessary and vitally important step in the development of economically competitive nuclear power. It also recognizes that the construction and operation of such prototypes must be subsidized by Government or industry or both inasmuch as such plants are not likely, at this stage of the art, to be economical. The Commission takes the view that while it must take the lead and carry most of the burden of developing nuclear power reactor technology, industry should take the initiative and assume the major responsibility for full-scale prototype reactors. Some Government financial and technical support may, of course, be needed, but the direction and level of this support should remain flexible to meet the needs of particular situations and stages of development.

The proposed legislation therefore raises fundamental questions with respect to this existing Commission policy since it would direct the AEC to undertake with public funds a major portion of the prototype reactor phase. Which of the alternatives is the best must be resolved in terms of which will result in the greatest long-term good to the Nation. This, of course, will depend on what is the long-term goal. It has been, and is, the Commission's view that the goal of United States policy should be the eventual development of economic nuclear electric power and not an immediate kilowatt race with other nations. It should be clearly emphasized that it is our belief that an aggressive and continuing reactor research and development program is the only basis on which we can establish and maintain world leadership in the development of nuclear power and achieve our goal of economically competitive nuclear power in the United States. To prevail in a nuclear kilowatt race might, in the short run, appear to be an accomplishment, but we fear that it would not only be unduly costly in terms of the benefits to be gained, but that it would divert effort and scarce technical manpower from the real goal and consequently delay its achievement. The attainment of competitive nuclear power in the United States, with its efficient conventional powerplants and relatively cheap fuels, is going to be difficult. We cannot favor a measure which sets an arbitrary goal in terms of the number of nuclear power facilities without providing the flexibility to take into consideration the competing, and in our view paramount, demands of research and development.

While the AEC has often made economic analyses of nuclear power, it recognizes that these estimates have not generally been made with the detailed industrial utility background on the overall economic considerations involved in financing, engineering, construction, operation, and distribution of added capacity on a systems basis. It is our belief that publicly, cooperatively, and privately owned utilities engaged in the sale of atomic energy and equipment manufacturers are in a much better position than the Commission or its laboratories to assess the economics of particular reactor concepts and to determine which ones are in the stage of development where the construction of a prototype is a logical and appropriate step. For these reasons the Commission has encouraged industry to undertake the construction and operation of full-scale prototypes. However, if a particular reactor concept appears to us to have reached the stage of development where the construction of a prototype is a logical and appropriate step, and if it should appear, after appropriate public invitations for proposals for joint AEC-industry projects, that industry is not prepared to undertake the construction and operation of such a prototype, the Commission would give serious consideration to the desirability of going forward with the project using entirely public funds.

The prototype stage in reactor development is largely concerned with establishing and reducing construction and operating costs and it is therefore the final stage in the approach to economic nuclear power. We believe it to be of the greatest importance that the maximum economic incentives to cost reduction be preserved at this stage. This, in our opinion, can best be accomplished by industry taking financial and technical responsibility under conditions where it will sustain the major burden of whatever loss occurs and accrue the advantage of any economies. Government assistance in some respects may be necessary, but we do not believe that Government responsibility or Government cost contracts are likely to sufficiently provide the desirable incentives to cost reduction.

In our opinion, American industry is responding to this challenge in a very encouraging manner. It cannot be overlooked that we have had a formal power reactor development program for only slightly more than 2 years and that this length of time is wholly insufficient for the development of the vast technology necessary for construction and operation of really economic power reactors of any size or type. In addition, there are many problems such as insurance, chemical processing, and reactor hazards which contribute to the difficulty of initiating a nuclear power industry. However, solutions to these problems are being worked out and the development of the necessary scientific and engineering technology is proceeding.

Negotiations are going forward on the 3 proposals made and accepted under the first round of the power demonstration reactor program and on the 2 accepted so far under the second round invitation. The other five proposals under the second round are still being considered by the Commission. Four private reactor projects of very large size have been announced and are in variously early stages of prosecution. One power reactor and several research reactors have been sold abroad. Several additional foreign power reactors are known to be under very active consideration.

Summarizing the Commission's policy in juxtaposition to what appears to be the philosophy of the bills, it is the Commission's view that the primary goal of its power reactor program should continue to be on research and development as opposed to kilowatts of power, that the construction of prototypes should be based upon the state of both nuclear and conventional power technology and costs in the United States as opposed to the quantity of nuclear electric power being produced in other nations, that the erection of facilities, primarily for the purpose of producing electricity, should be left, with certain concessions which may be appropriate, to the laws of economics, and finally, that the Commission should, rather than be bound by a statutory direction, be permitted the operational flexibility to construct facilities when, in its technical judgment, such facilities and the technical manpower their construction will involve will be most productive of a meaningful technological advance.

Wholly apart from this difference in philosophical approach, enactment of the bills would create some extremely serious problems, several of which we should like to point out. First, enactment of the proposed bills would lead to implementation problems of considerable magnitude. If these projects are to be a part of a strictly Government program, the solution of these problems would fall upon a staff that is now fully engaged with existing phases of the nuclear power development program. Some appreciation of the magnitude of the task may be gained by a comparison with the construction of the Savannah River plant of the Commission. Savannah River involved 5 reactors of identical design by a single major contractor on 1 site with related feed materials, processing, and other service facilities. Subject to doubts we have already expressed, we interpret the provisions of S. 2725 and H. R. 10805 to require construction of 6 reactors, not already in contemplation, of 6 different designs in 6 different geographical sections of the United States. Several different major contractors undoubtedly would be involved. The mere selection of contractors for research and development, design, construction, and operation of these plants would be a major undertaking in itself. It is unlikely that this can be done without interfering with other major reactor efforts, military or civilian, or without providing some new facilities to equip new contractors in the reactor business. In addition, service facilities such as fuel preparation and processing would be necessary although they could perhaps be lesser in magnitude than at the Savannah River plant.

Second, there are the two inseparable problems of site selection and disposition of power. Site selection, given the criteria provided in the bill, is not, in and of itself, too difficult a problem to resolve. However, when its effect upon the disposition of the power generated is taken into consideration, it has a great many far-reaching consequences. It must first be recognized that the product of a nuclear power facility will be unfirm for at least a 5-year period due to the experimental nature of the facility. This means that the capacity of any system into which the power is introduced must be sufficiently large to absorb the reactor facility's output on a continuous basis and have the reserve capacity to provide standby power during time of reactor shutdowns. These factors themselves place limitations on the potential sites, although it may be assumed that there are some privately owned, some publicly owned, and some AEC-owned sites which could qualify. If sites were selected which would enable use of the power by the AEC or other Government agencies, no substantial additional problems of disposition of power would develop. However, since the power generated would, for

an initial period at least, be unfirm in nature, it would have a limited usefulness to the AEC and, considering its high-cost nature, the total cost to the AEC resulting from its use plus the charges which would have to be paid for standby power would greatly exceed present power costs.

The alternative to use of the energy by the Government itself would be a sale to some distributing system for ultimate use by nongovernmental consumers. The fact that the bill would direct the Commission, in selecting sites, to consider "the need for additional electric generating capacity in the region of the site under consideration" suggests that the Commission is to consider the possible needs of ultimate nongovernmental consumers for the energy generated from the reactors which it would be directed by the bill to construct. Any such disposition of nuclear energy would involve the Commission in complex problems of interpretation and administration of the preference provisions of section 44 of the act on a scale for which it is not presently staffed or equipped. The distribution problems would be rendered particularly acute by reason of the fact, already pointed out, that for some years at least the energy will be of relatively unfirm character. And, since the location and perhaps the size of the facility might have a substantial effect upon the ability of preference or nonpreference groups to utilize the power, it is reasonable to predict that, even on these essentially technical matters, the AEC would find itself caught in the crossfire of the public versus private power controversy.

The desire to avoid a diversion of effort from its primary function of furthering research and development in nuclear technology through becoming involved in administrative and political problems such as have been mentioned above is an added reason why the Commission would be most reluctant to be required to embark on a major program of constructing, and presumably operating, full-scale nuclear powerplants.

It is our conclusion that we are opposed to the enactment of the proposed bills. They place upon the Commission an arbitrary and inflexible requirement which would divert vital research and development effort to less productive work. It would also lead to reactor prototypes being constructed without the all-important economic incentives. The absence of these incentives would, in our opinion, delay the day when nuclear power is likely to become economically competitive in the United States.

Without specific knowledge of the types of reactors to be built, their size, location, and other relevant factors, it is not possible to estimate with any accuracy the cost of the proposed program. However, on the assumption that the bill would call for large output reactors, we believe that cash expenditures would probably be in the order of $400 million for the development, design, and construction of the reactors and generating facilities, and that they would require 4 to 5 years for completion. Operation of these plants, for 5 years after construction had been completed, would probably require an additional $200 million or so, making expenditures for the program about $600 million for a 10-year period. This, of course, does not include the cost of construction and operation of auxiliary facilities for transmission, fuel reprocessing, etc. The value of the power produced during this period would probably offset no more than one-quarter of the total expenditures.

All of the views expressed in this letter are not concurred in by Commissioner Murray.

The Bureau of the Budget has advised us that it has no objection to our transmitting these comments and that it concurs in the conclusions expressed.

Sincerely yours,

W. F. LIBBY, *Acting Chairman.*

HOUSE OF REPRESENTATIVES,
OFFICE OF THE LEGISLATIVE COUNSEL,
July 3, 1956.

Hon. CLARENCE CANNON,
Chairman, Committee on Appropriations,
House of Representatives, Washington, D. C.

DEAR MR. CANNON: We have been asked by Mr. John Donnelly, of the staff of the Committee on Appropriations, to give you our views on the question of whether or not there is authority in existing law for the appropriation of funds to the Atomic Energy Commission for the construction of large-scale power reactor demonstration facilities of the type described in S. 4146.

The Acting Chairman of the Atomic Energy Commission, in a letter to the Chairman of the Joint Committee on Atomic Energy (dated May 18, 1956, and

printed on pages 67–71 of the Joint Committee's Hearings on Proposed Legislation for Accelerating Civilian Reactor Program), expresses the view that "no substantive legislation is necessary to authorize the Commission to construct full-scale demonstration reactors"; he asserts that the facilities could be constructed under the existing provisions of section 31 of the Atomic Energy Act of 1954, which authorizes and directs the Atomic Energy Commission "to make arrangements (including contracts, agreements, and loans) for the conduct of research and development activities relating to * * * utilization of special nuclear material, atomic energy, and radioactive material and processes entailed in the utilization or production of atomic energy or such material for all other purposes, including industrial uses, the generation of usable energy, and the demonstration of the practical value of utilization or production facilities for industrial or commercial purposes".

The view expressed by the Acting Chairman of the Atomic Energy Commission is apparently based on the assumption that, since there is ample authority to construct the facilities in section 31 of the Act (as there would be also in the provisions added to the Act by S. 4146), any appropriations necessary to carry out the construction are automatically authorized. If the Acting Chairman is contending, on the basis of section 31, that there is authority in existing law for appropriations to carry out the construction as well as basic authority for the construction itself (and it is not clear to us whether that is his contention), his position reflects the normal rule as we understand it; but that rule is of course subject to limitation by express language, and we think that such a limitation exists and is controlling in this case.

Section 261 of the Atomic Energy Act of 1954 which contains provisions relating to appropriations, reads in pertinent part as follows:

"There are hereby authorized to be appropriated such sums as may be necessary and appropriate to carry out the provisions and purposes of this Act *except such as may be necessary for acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion.*" [Italic added.]

It seems to us that, although section 31 of the Atomic Energy Act of 1954 (as well as the new provisions which would be added to that Act by S. 4146) would provide basic authority for the construction of the facilities concerned, the language of section 261 (quoted above) makes it clear that there is no authority in that Act for the appropriation of funds for the acquisition, construction, or expansion of such facilities. This conclusion is supported by the statement of managers accompanying the conference report on the Atomic Energy Act of 1954 (H. Rept. No. 2639, 83d Cong., 2d sess.), which states that the construction of demonstration facilities under section 31 a. (4) of the Act "would require specific authorization by the Congress as provided in section 261." In this connection a few statements were made on the floor of the House and Senate during the consideration of the conference report on the Act; but, so far as we have been able to discover, none of these statements specifically touched upon the problem of appropriations to carry out this construction.

Accordingly it appears to us that there is no provision in existing law (other than the provisions of Public Laws 141 and 506, discussed below, which do not apply to the facilities contemplated by S. 4146) authorizing the making of appropriations for the construction of plants or facilities under the Atomic Energy Act of 1954.

It should be noted that legislation authorizing the appropriation of funds for the acquisition, construction, or expansion of specified plants and facilities by the Atomic Energy Commission was passed in both the first and second sessions of this Congress (Public Laws 141 and 506) before the appropriations were made. In the report of the Joint Committee on Atomic Energy on H. R. 6795 (which became Public Law 141), the following statement appeared:

"The Atomic Energy Act of 1946, which was the basic atomic control law until the passage of the Atomic Energy Act of 1954, authorized the appropriation to the Commission of 'such sums as may be necessary and appropriate to carry out the provisions and purposes of this act.'

"Under this broad and general authorization the Commission was enabled to seek appropriations for operations, equipment, plants, facilities, real estate, or any other purposes covered by the Atomic Energy Act of 1946. Such blanket authority to seek appropriations is not normal to Government activities and was given to the Atomic Energy Commission because the program in 1946 was undefined and not amenable to treatment under normal budgeting practices of the Government. Since 1946, however, the Commission's program has become more clearly defined and with almost a decade of experience it became clear to the Joint Committee that the Commission's authority to seek appropriations should be brought more

in line with that obtaining in other areas of Government. Therefore, the Atomic Energy Act of 1954 modified the Commission's authority to seek appropriations [by adding the language of sec. 261 (quoted above)].

"The effect of this language as stated in the report accompanying the bill was to require the Commission 'to obtain congressional approval of new construction or expansion of its plants.'

"The bill, H. R. 6795, is the first authorizing legislation resulting from the change in the Commission's authority to seek appropriations outlined above."

In the report of the Joint Committee on H. R. 10387 (which became Public Law 506), there appeared the following statement:

"When the Atomic Energy Act of 1954 was enacted, it contained, for the first time, exceptions to the general authorization previously contained in the law * * * This is the second annual authorization legislation to be enacted pursuant to [the portion of section 261 which is underscored as it appears in this letter].

In summary, it seems clear to us that specific authorizing legislation (such as the provisions contained in sec. 4 of S. 4146) is needed before funds can be appropriated, consistently with the Rules of the House, for the construction of the facilities concerned, and we would further make the observation that the practice since the enactment of the Atomic Energy Act of 1954 has been in accord with this conclusion.

Sincerely yours,

ALLAN H. PERLEY,
Legislative Counsel.

AEC LETTER QUOTES HOUSE CONFERENCE REPORT OUT OF CONTEXT

Chairman CANNON. In the course of this letter as justifying the conclusion reached, the letter cites from the House conference report on the 1954 Act. It says:

> The report of the managers for the House, accompanying the conference report on the Atomic Energy Act of 1954, states that this language was intended "to clarify the authority of the Commission to build or to contract for the building of large-scale atomic energy utilization facilities for the purpose of demonstrating the practical value of such facilities in the generation of electricity."

But why, Dr. Libby, did you not quote the next sentence in that same excerpt? The next sentence is particularly significant. Here is the next sentence which immediately follows the matter which you quoted in the letter. You are quoting from the statement of the managers. I am reading from the statement of House managers on the report accompanying the bill, H. R. 9757, report No. 2639, on page 46 of that report. Closing the excerpt which was included in Dr. Libby's letter, but omitted from his letter, we have this sentence:

> The construction of such large-scale demonstration facilities would require special authorization by the Congress as provided in section 261.

Now, why did you cut that sentence out of the quotation when you put it in your letter?

Dr. LIBBY. May I ask the General Counsel to reply to your question, sir?

Chairman CANNON. Mr. Mitchell.

Mr. MITCHELL. Mr. Chairman, Dr. Libby's letter was addressed to Senate 2725, which is the Gore bill, and its counterpart, H. R. 10805, both of which provided for permanent amendments to the Atomic Energy Act of 1954.

Now, our comments must be read in that light.

As printed on page 68 of the hearings, Dr. Libby's letter said this in part:

> Accordingly, the bills would not add to the Commission's substantive authority. They would rather direct the Commission to exercise its existing authority under section 31 by constructing six plants of the character and location indicated, and would authorize necessary appropriations for that purpose.

Now, calling your attention to page 39 of the hearings, Mr. Strauss said this:

> We are prepared to exercise that authority, and to request authorization and appropriations for such plans whenever it appears to us as a true test for this effort, that we have developed a reactor concept * * *

and so forth. In other words, Mr. Strauss defended an understanding that the request for authorization for appropriations would be necessary.

And on page 74, Senator Gore said this to me. This is shown toward the bottom of the page.

Chairman CANNON. If I may interrupt you at this point, here is a statement on page 39, Admiral Strauss is speaking:

> We are prepared to exercise that authority, and to request authorization and appropriations for such plants whenever it appears to us as a true test for this effort, that we have developed a reactor concept sufficiently to make it timely for construction of a prototype * * *

and so forth.

At the time this letter was written, apparently Admiral Strauss knew authorization would be required, and still the letter is very emphatic, the letter signed by Dr. Libby is very explicit and says unequivocally that it would not be required.

Mr. MITCHELL. Mr. Chairman, on page 74, toward the bottom of the page, Senator Gore, during the course of the hearing, said this to me:

> You are authorized to do it, but the Congress is not authorized to make any appropriation for it without further legislation.

I replied:

> You are perfectly right that this would be an authorization for appropriations, which otherwise we would have to receive separately.

The point is this, sir——

Chairman CANNON. There could not be anything clearer than that, Mr. Mitchell. Why did you write this letter in which you said it would not be necessary?

Mr. MITCHELL. May I please explain that, sir?

Chairman CANNON. Yes; if you will.

Mr. MITCHELL. The point is this: The bill would provide a permanent amendment to our basic statute. Our point was that this was not necessary. We did recognize that in order to proceed with any particular project in any particular year, we would have to submit an authorization bill for appropriations under section 261, which is an annual affair and which relates to construction of plant, but not to operating the plants.

In other words, what we were saying, sir, was this: that an amendment to our basic statute, the permanent legislation, was not necessary. We did recognize, however, that an authorization for appropriations would be necessary.

Chairman CANNON. You make it just a little bit worse all the time. You write a letter here in which you do not express any doubt about it at all, you tell us that you are authorized without any further legislation when the statute specifically requires it and the citation from the report requires it.

Evidently you did not want legislation.

You took this means to leave the impression that would result in no legislation and the most significant thing of all is that in concluding the quotation which justified your whole conclusion, the very heart of the letter, you deliberately omitted, you carefully cut out the last sentence, which would have vitiated the whole letter.

Who asked you to write that letter, Mr. Mitchell?

Mr. MITCHELL. Mr. Chairman, as legal adviser for the Commission, I work with the Commission on any questions of law which may arise during the course of our work. This was part of my normal functioning.

Chairman CANNON. Yes, but who asked you to write this letter?

Mr. MITCHELL. Sir, I respectfully suggest——

Chairman CANNON. I would not think that he needed any prompting, Admiral Strauss.

Mr. STRAUSS. I am not prompting him. I started to interrupt: that that was a question that could be more appropriately addressed to me.

Chairman CANNON. That is prompting.

Mr. STRAUSS. I did not say it and I did not prompt the witness at all.

Chairman CANNON. You made the statement.

Mr. STRAUSS. I said I was about to say it to you, sir.

Chairman CANNON. What did you say to him just now?

Mr. STRAUSS. Nothing whatsoever.

Chairman CANNON. Yes, you did. Sitting just across this table I saw you say something to him within the last minute or two.

Mr. STRAUSS. I did not say anything to him.

Chairman CANNON. You certainly did. You turned to him and you said something to him in a low voice which I did not understand.

It is precisely the case of the errant husband, who when called to account by his wife, said "Honey, are you going to believe me or believe what you hear?" That reconciled her. But a few days after, when she caught him kissing the maid, he said "Honey, are you going to believe me or believe what you see?" Admiral Strauss wants us to believe him and not believe what we have just seen.

AEC GENERAL COUNSEL CLAIMS ATTORNEY-CLIENT PRIVILEGE

All right, Mr. Mitchell, now tell us who told you to write the letter.

Mr. MITCHELL. Sir, I respectfully suggest that in my relationship to the Commission as counsel, it is not appropriate for me to discuss who asked me to give a particular opinion or the circumstances under which I did it.

Chairman CANNON. It is a matter of interest to this committee to know who deliberately wanted to disseminate false and fraudulent information, because that is what this letter is. The letter conveys false and fraudulent information, and it does it deliberately, because you omitted the last sentence of the excerpt which you quoted.

Now, it is the business of this committee to know from what source such a policy comes.

Mr. MITCHELL. Sir, I beg to differ with you on what you have to say.

Chairman CANNON. Do you decline to answer as to who asked you to write this letter? I am asking Mr. Mitchell and not Admiral Strauss.

Mr. MITCHELL. First of all, Mr. Chairman, I take exception to your statement that this was false and fraudulent.

Secondly, I stand on my position that, as legal counsel for the Commission, this is a confidential relationship and I do not think it is appropriate for me to discuss who asked for my opinion or the particular circumstances under which I gave it.

Chairman CANNON. If there were not something here that you do not want the committee to know, there would be no objection to answering such a question: Who asked you to write the letter?

It is a very simple question. Unless you wanted to conceal something from this committee, you would answer it promptly.

Mr. MITCHELL. Sir, I have no intention to conceal anything.

This is a matter of principle.

Mr. STRAUSS. Will you permit me to comment on your question, Mr. Chairman?

Mr. PHILLIPS. Mr. Chairman, will you please read into the record again the last sentence of this paragraph which I think is exceptionally important in view of the questions you are now asking.

If you will permit me I will read it. I now quote from page 68, the paragraph which the chairman has already read and I quote the last sentence.

> They would rather direct the Commission to exercise its existing authority under section 31 by constructing six plants of the character and location indicated—

and here comes the final clause after the conjunction—

> and would authorize necessary appropriations for that purpose.

Now, it seems to me that is the issue before us. I find nothing in here which says anything more than that the Commission holds that it has authority to conduct its own business but that if it wants money for conducting its own business it recognizes the necessity of coming before the Congress to ask for it. Now I think that ought to be read into this in view of the statements which the chairman has just made.

Chairman CANNON. The statement which the gentleman read to us refers to the six plants. The statement with which we are dealing is the general statement that no legislation is required to authorize appropriations.

Mr. PHILLIPS. But, Mr. Chairman, the bill that they are discussing is a bill, the heading of which says:

> Authorizing and directing the construction by the Atomic Energy Commission of six nuclear power facilities in the production of electrical energy.

That is what they are being asked about.

Chairman CANNON. That is right.

Mr. PHILLIPS. Have they got a right to answer?

Chairman CANNON. That is not the thing with which we are dealing here. The thing with which we are dealing here is that they said no additional authorization is necessary and the legislative counsel said that it is necessary and apparently they knew it at the time because Admiral Strauss had previously said they would have to have authorization and the most significant thing of all is that in inserting the excerpt from the report they cut out the last language of the paragraph which expressly contravenes the tenor of the entire letter.

Mr. PHILLIPS. I think the discussion may be helpful in the long run but what I want to point out is that the Commission was asked to report and give an opinion upon a specific bill. In my opinion they did so. I want the record to show that the chairman is now asking questions upon a subject which was not before the Commission or the Congress at that time and is attempting to read into the letter something which was not pertinent at that time. That is all.

Chairman CANNON. I am only reading what is in the letter and the letter makes a false statement, a statement which Admiral Strauss knew at the time was not correct.

Mr. STRAUSS. That is not correct. I rise to a point of personal privilege, to have you impute to me, sir, that I made a statement that knowingly was not correct is a false statement.

Chairman CANNON. You said previously that you did not have the authority. Now here comes the letter which says you do have the authority.

Mr. STRAUSS. Just in the matter of time. My statement was made on the 23d of May. This letter is dated the 18th. They are consistent, but you are wrong in your timing.

STRAUSS RESPONSIBLE FOR AEC LETTER

Chairman CANNON. The dates are immaterial. You say that you do not have the authority but the letter which you prepared and which you have stood by all this time——

Mr. STRAUSS. You bet I stand by it. I would like to take full responsibility for having asked the General Counsel of the Commission to prepare the letter.

Mr. PHILLIPS. Have you ever said anything believing to be a fact—the date is not important—did you ever say anything that you thought was a fact and then later on have an attorney tell you that is not what he thought about it?

Chairman CANNON. May I say to the gentleman from California that is not the situation. The letter said he did not have the authority and they have stood by this letter to this date. They say they do have construction authorization.

Mr. PHILLIPS. For construction but not appropriation.

Chairman CANNON. It speaks for itself. They say they have authority when they do not have authority.

Mr. PHILLIPS. Well, better let the Commission answer. I am not the witness.

Chairman CANNON. Mr. Murray?

Mr. JAMES C. MURRAY. I have no questions. The question I have has been clarified by the subsequent colloquy between members.

Chairman CANNON. Are there any questions on the part of the committee?

Mr. PHILLIPS. On what?

Chairman CANNON. On the subject we have just discussed.

Mr. Taber or Mr. Phillips?

LETTER OF AEC FURTHER EXPLAINED

Mr. TABER. Now we have called to our attention that the Commission submitted a letter through Dr. Libby in which the statement appeared that these bills would direct the Commission to exercise its

existing authority under section 31 by constructing six plants of the character and location indicated, and would authorize necessary appropriations for that purpose. Now, Mr. Mitchell, what did you mean by that statement?

Mr. MITCHELL. Mr. Taber, what we mean was that an amendment to the Atomic Energy Act of 1954 was not necessary in order to give the Commission the basic authority to proceed with a program of this kind. This basic authority was distinguished from the annual authorization acts for appropriations which we must get on the plant and equipment side and which are not amendments to the Atomic Energy Act, but are recurring bills.

Mr. TABER. Do you have section 31 in here?

Mr. MITCHELL. Yes, sir.

Mr. TABER. Will you read part of that section which gives the Commission the authority to do what you referred to on page 68?

Mr. MITCHELL. Yes, sir.

Mr. TABER. What part?

Mr. MITCHELL. It is the last part of subsection (a) which reads:

> To this end the Commission is authorized and directed to make arrangements (including contracts, agreements, and loans) for the conduct of research and development activities relating to—

and then I skip down to subparagraph (4), and part of that reads as follows—

> the generation of usable energy, the demonstration of the practical value of utilization or production facilities for industrial or commercial purposes.

Mr. PHILLIPS. You should include No. 1.

Mr. MITCHELL. "Nuclear processes," yes, sir.

Mr. TABER. Now what does that authorize the Commission to do?

Mr. MITCHELL. Among other things, Mr. Taber, it would give the Commission the basic authority to construct prototype reactors, including large scale ones, for research and development purposes leading to either the generation of usable energy or the demonstration of the practical value of these facilities for industrial or commercial purposes.

Mr. TABER. Then it would be required that these projects must be in the nature of research and development?

Mr. MITCHELL. Yes, sir, but they could be full scale.

Mr. TABER. What?

Mr. MITCHELL. They could be large.

Mr. TABER. They could be large?

Mr. MITCHELL. Yes, sir.

Mr. TABER. Would you construe research and development to include a power reactor setup of a size of, say, 100,000 kilowatt capacity provided the funds had been appropriated for that purpose?

Mr. MITCHELL. Yes, sir, I would because at the present stage of the art there would be a great deal of useful knowledge which could be acquired from the construction and operation of such a facility.

Mr. TABER. If the Commission undertook to build powerplants with the reactors that had previously been perfected, would that be a different situation?

Mr. MITCHELL. Yes, sir, I think it would. Here I call attention to the last part of section 44 of the act which reads that:

> Nothing in this act shall be construed to authorize the Commission to engage in the sale or distribution of energy for commercial use except such energy as

may be produced by the Commission incident to the operation of research and development facilities of the Commission, or of production facility of the Commission.

So I think the question, would be, sir, whether the particular reactor that we are building was of a type that would lead to further knowledge.

Mr. TABER. Would that apply to the authority that the Commission had to go ahead with the reactor, with Duquesne and Westinghouse? That was an experimental job, was it not?

Mr. MITCHELL. Yes, sir; it was.

Mr. TABER. And is yet?

Mr. MITCHELL. That is right, sir.

Mr. TABER. Do you own the reactor at that plant?

Mr. MITCHELL. Yes, sir; we do.

Mr. TABER. The only things that are not otherwise included are routine generators and buildings that are not of an experimental type, is that right?

Mr. MITCHELL. This is true at the Duquesne installation, Mr. Taber.

Mr. TABER. That is what I was asking.

Mr. MITCHELL. I think probably that if it were necessary to the total project to install generating facilities as well in order to test them out with the reactor, under Section 31 the Commission could also do this.

Mr. TABER. Provided appropriations had been made for that purpose?

Mr. MITCHELL. Yes, sir; and on an annual basis.

Mr. TABER. It would not matter whether it was annual or by a supplemental bill or what?

Mr. MITCHELL. That is right.

Mr. TABER. What character it was as long as the funds were provided for that specific purpose would not matter?

Mr. MITCHELL. Yes, sir. The only point was that the provision of funds is not normally accomplished by a permanent amendment to the basic statute.

Mr. TABER. Have you anything else that you would like to say in connection with this letter of an explanatory type or otherwise?

Mr. MITCHELL. No, sir. I have attempted to make our position clear that we were talking about here a bill that would have been a permanent amendment to the basic statute. It was in this context that we said we did not need any additional authority. Our letter also pointed out, as Mr. Phillips suggested, that the legislation had the other effect of authorizing appropriations. We recognized this.

Mr. TABER. Now I would like to ask Admiral Strauss if he would care to make a statement on the question as to whether or not he goes along with what Mr. Mitchell has just told us.

Mr. STRAUSS. I do, Mr. Taber, and I call attention to the fact that even Senator Gore, whose experience not only includes membership in the Senate at the time the 1954 act was debated and passed but also was a member of this committee prior to that time, when he was a Member of the House, and who has a familiarity with the appropriation and authorizing process says, and I am quoting, "You are authorized to do it." There is no question of the fact that our present statute, as Dr. Libby said in his letter, is an authorization.

You are authorized to do it, but the Congress is not authorized to make any appropriation for it without further legislation.

Mr. Mitchell responded:

You are perfectly right that this would be an authorization for appropriations, which otherwise we would have to receive separately.

I do go along with the letter, Mr. Taber. A query from the Chairman of the Joint Committee addressed to the Commission asking for a Commission opinion on legislation is in the ordinary course, and has always been, since my connection with the Commission, referred to the general counsel for the preparation of a reply. I believe that to be true throughout the agencies of the Government and no specific direction was given to Mr. Mitchell, I do not believe, to prepare a reply to this specific letter. It reached him in the ordinary course of business of the Commission and the letter was prepared. It undoubtedly went through the Commission process of being examined for fact by the different divisions of the Commission involved and by the general manager and came in the ordinary course to the chairman or the acting chairman for execution.

Mr. TABER. Now I call your attention to page 39. If I am reading correctly, you said:

We are prepared to exercise that authority, and to request authorization and appropriations for such plants whenever it appears to us as a true test for this effort, that we have developed a reactor concept sufficiently to make it timely for the construction of a prototype, and when, after appropriate public invitation for proposals for joint AEC-industry projects, it ever appears that industry, cooperative or private, is not prepared to undertake such construction. Thus far industry has not failed to meet each situation.

Now do you care to develop that any further?

Mr. STRAUSS. I did, Mr. Taber, in the continued answer to that question of Senator Anderson. I think I would rest on that language. I said:

* * * should a promising new reactor concept be ignored or rejected by industry while I am Chairman, I would recommend that the Commission build a prototype nuclear powerplant to prove out the new reactor concept.

Mr. TABER. Now have you any further comments with reference to the matter under discussion at the present time?

Mr. STRAUSS. No, I have not, Mr. Taber.

AUTHORIZING LEGISLATION DEFINITELY REQUIRED

Mr. TABER. Would you feel, and I am going to ask that same question of Mr. Mitchell, that we would have the authority under the law to make an appropriation for the construction of nuclear powerplants in the area of the Tennessee Valley Authority, first as a research proposition? That is not my whole question. I have another one to follow it.

Mr. STRAUSS. I believe that section 31 does provide for that.

Mr. MITCHELL. Subject to authorizing legislation for appropriations, Mr. Taber.

Mr. TABER. Do you mean that an appropriation has not been authorized as yet for that purpose?

Mr. MITCHELL. That is right, sir.

Mr. TABER. Has it or has it not, insofar as it relates to research?

Mr. MITCHELL. Let me put it this way, sir, that so far as we have plant——

Mr. TABER. I think you understand that we have a practice here in the Congress of authorizing legislation and separately of appropriation authority.

Mr. MITCHELL. Yes.

Mr. TABER. Now, has it been authorized so that this committee would have a right to make appropriations for it if it was a research job?

Mr. MITCHELL. This depends on what we have in our current budget, Mr. Chairman.

Mr. TABER. No, it does not depend on that at all. The idea is whether or not the Congress has the authority, the Appropriations Committee has the authority to make an appropriation. That is the question. It matters not whether or not you have anything in your budget.

Mr. MITCHELL. Let me put it this way, sir. The present authorizing bill which has been signed applies to our original appropriation request. We have pending a second authorizing bill which would authorize an additional amount.

Mr. TABER. Now, wait a minute. The thing I am trying to find out is whether or not the legislation is strong enough so that the committee is authorized to make an appropriation.

Mr. MITCHELL. For a full-scale plant?

Mr. TABER. Yes.

Mr. MITCHELL. No, sir; I don't think it is.

Mr. TABER. Even if it is on an experimental basis?

Mr. MITCHELL. That is right.

Mr. TABER. Or if it is connected with your research activity?

Mr. MITCHELL. I am subject to correction by our financial people but I do not believe——

Mr. TABER. I do not think that would be a matter for the financial people. It would be a matter for a lawyer.

Mr. STRAUSS. Mr. Chairman, I do not believe that counsel has understood your question.

Mr. TABER. I did not think so.

Mr. MITCHELL. I think the answer to your question is that in the present posture the committee cannot appropriate money for this purpose since the authorizing legislation is absent.

Mr. PHILLIPS. For what?

Mr. MITCHELL. That is why I say, sir, this depends on what is in our present authorizing bill or the bill which we have currently pending.

Mr. TABER. You are sure that insofar as it is an experimental job you are covered by section 31?

Mr. MITCHELL. So far as basic authority is concerned; yes, sir. We are talking now of appropriation authority.

Mr. PHILLIPS. I still don't think counsel understands the question.

Mr. TABER. The question is whether section 31 constitutes an authorization for this committee to proceed with an appropriation.

Mr. MITCHELL. So far as plant and equipment is concerned, Mr. Taber, it does not because of section 261.

Mr. TABER. What does that say?

Mr. MITCHELL. Section 261 on page 42 of the act says:

There are hereby authorized to be appropriated such sums as may be necessary and appropriate to carry out provisions and purposes of this act except such as may be necessary for acquisition or condemnation of any real property or any facilities or for plant or facility acquisition, construction, or expansion.

In other words, for a plant, or facility acquisition, or construction we need a separate authorizing measure for an appropriation.

Mr. PHILLIPS. Then, Mr. Mitchell, you have been talking about the money you have which has already been appropriated for the specific program, authorized for the specific program which the Commission has been testifying to.

Mr. MITCHELL. Yes, sir.

Mr. TABER. Have you had legislative authority for your contracts with these various people, various corporations, that are referred to on the chart that we were given?

Mr. MITCHELL. As to those, under the first round, sir, we have had an authorization for plant and equipment. There are also operating funds involved in this program. So far as operating funds are concerned, we do not need authority before we get an appropriation.

Mr. TABER. But for plants which are built by the Government that relate to anything beyond round 1, where the Government was paying the charge for anything, you would need authorizing legislation?

Mr. MITCHELL. We have some authorizing legislation. This is both what we currently have and what we are now requesting at this session, sir.

Mr. RABAUT. Mr. Taber, your question was as to round 1, was it not?

Mr. TABER. The first question was directed to the whole picture. But he answered that they have the legislative authority for round 1. I think that you had some legislative authority for some things beyond round 1.

Mr. MITCHELL. Yes, sir.

Mr. TABER. I did not ask for the detail.

Mr. FIELDS. Mr. Taber, last year there was an authorization and an appropriation in the amount of $25 million for plant and acquisition without reference to round 1 or round 2. It was for the power acceleration project for plants necessary for research development and experimental purposes.

POWER DEMONSTRATION PROGRAM—ROUND ONE AND ROUND TWO

Mr. JENSEN. I think round 1 and round 2 should be defined for the record.

Mr. TABER. Have we not defined that in the hearings so far?

Mr. FIELDS. Yes, sir.

Mr. TABER. Now if we have not defined round 1 I would like to have you define it and then define round 2 and if there is something beyond that, define that.

Mr. FIELDS. Mr. Davis, will you define round 1 and round 2?

Mr. DAVIS. The first round under the power demonstration reactor program was initiated by public invitation by the Commission on January 10, 1955. Companies were invited to make proposals to the Commission by April 1, 1955, for full-scale power reactors. We received 4 such proposals, 1 of which was subsequently converted into a

straight license application, that of Commonwealth Edison Co. and associated power groups. I believe it was September 21, 1955, I don't have the exact date, we issued a second public invitation with a closing date of February 1, 1956. This invitation limited the size of the reactor and size range. We received seven proposals under this invitation, all of them were from cooperatives or municipal electric companies for reactors in this size range.

Mr. TABER. Beyond round 2 there is no classification so far?

Mr. DAVIS. The Commission has not yet authorized any additional undertakings.

Mr. TABER. Now for round two what, if any, authority have you to ask for appropriation for it?

Mr. DAVIS. As the general manager outlined, we asked for an authorization and an appropriation for fiscal 1956 in the amount of $25 million for plant and equipment to cover what we call the power reactor acceleration program. This included funds to be spent under the power demonstration program and also for research and development facilities needed for the Commission's program. For fiscal 1957 we have asked for $15 million additional to supplement those funds to be used for the same purpose. This is carried in the budget under the heading "Power reactor acceleration."

FUNDS APPROPRIATED FOR POWER REACTOR ACCELERATION

Mr. TABER. That is all I have on legislation, but I have some questions that I do desire to ask.

Mr. RABAUT. Before you leave that subject, could I ask one related question?

Mr. TABER. Certainly.

Mr. RABAUT. You talked about a sum of money a few minutes ago that you said was not designated for round one and the other. You mentioned that, General Fields.

Mr. FIELDS. Yes, sir.

Mr. RABAUT. How was that money applied? Was it applied to both sections?

Mr. FIELDS. Yes, sir; we have committed approximately $10.5 million for the first round. For the second round, we will commit about $6.3 million for the Elk River and the Wolverine Cooperative proposals.

Mr. RABAUT. Will that use up the entire sum of those two figures?

Mr. FIELDS. No, sir. We have two relatively minor projects in our own program. One is for a works area at Brookhaven National Laboratory, and the other is for an organic moderated reactor experiment building. These two projects come to $800,000, making a total of $17.6 million for all programs that are under way.

Mr. RABAUT. What was the original total figure, sir?

Mr. FIELDS. The total is $25 million. That leaves a balance for commitment of $7.4 million. This is the figure I mentioned the other day, sir.

Mr. RABAUT. Yes; that is right.

Mr. FIELDS. We have requested an additional $15 million for plant for this power-acceleration project in fiscal year 1957.

Mr. PHILLIPS. Mr. Taber, will you yield before you start another line of questioning?

Mr. TABER. Certainly.

Mr. PHILLIPS. What confuses me, and what I now translate into a question to the Chairman of the Commission or any other Commissioner who wants to answer it, I was unable to see any difference in the relationship between the Congress and the Atomic Energy Commission than exists in the normal relationship between the Congress and any of the constituent agencies of Government. In order to do anything, first an authorization bill must be reported out of a legislative committee and passed by the Congress. That gives the right to make plans and go ahead. But following that, before they have any money to spend, they must come to the Appropriations Committee and ask for the money, and that the Commission has done, and I gather from the Commissioners and the General Counsel, that is what they recognize they must do.

Now, we may go a step farther. We may even, in an appropriation bill, authorize the expenditure of money for some project or some objective which has actually not come out of a legislative committee and while we rarely do it, that constitutes the full and necessary authorization.

I think an example would be the money which was put in the bill in 1953 to start the first power reactor moving toward the development of energy for peaceful purposes. Now I simply ask you in that brief résumé if I have not stated the attitude of the committee and if the Chairman or any member of the Commission sees any difference between the Congress and the Atomic Energy Commission than is the normal relationship between Congress and any other agency.

Mr. RABAUT. Yes, you could do that but the one would be subject to a rule. That kind of activity would be subject to a point of order.

Mr. PHILLIPS. Mr. Rabaut's addition is very good. The matter of fact is that we do occasionally do it and we did it in 1953 with the Atomic Energy Commission.

Mr. RABAUT. Remember the time they refused me a point of order?

Mr. PHILLIPS. I remember the time that the distinguished Member from the State of Michigan raised a point of order on every item in the bill, practically.

Mr. FIELDS. In 1953 we did not have the restrictions contained in section 261 of the present act.

Mr. JENSEN. Mr. Phillips, will you yield for a minute?

Mr. PHILLIPS. I do not have the floor. Mr. Taber has the floor.

Mr. TABER. Go ahead, Mr. Jensen. I yield to you.

Mr. ANDERSEN. What was the answer?

Mr. STRAUSS. The answer is affirmative and I have just confirmed that with counsel because I would feel incompetent on my own to respond.

Mr. PHILLIPS. If it is affirmative it should be that you agree with me because my question was, Did you see any difference between your relationship——

Mr. STRAUSS. As you developed the question you said that you did not see any difference, and I was in agreement with that.

Mr. JENSEN. I think it should be said that when the Appropriations Committee decides to appropriate an amount of money for any agency which has not been authorized, the Appropriations Committee I think always uses this term, "Not more than," a certain sum of money, "may be used for this purpose." It is a limitation on an appropriation. By that method we get around the project being actually authorized, by simply calling it a limitation on an appropriation bill, which no doubt has been abused to some extent at times. Now I think I can see where the difficulty has arisen between the legislative counsel and what Dr. Libby says in his letter. Dr. Libby used the phrase, "authorize appropriations"——

Dr. LIBBY. We used "authorized to construct."

Mr. JENSEN. The point I want to make is this, that the term is used quite often "We hereby authorize appropriation," in bills that the House passes. Now there are times when we make an appropriation and an authorization at the same time by certain language that we use. But, generally speaking, we never tie the word "authorization" and the word "appropriation" together. And I think, Dr. Libby, as you used the phrase, you sort of tied them together and you did not intend to give the impression that there was an appropriation for this thing we were talking about, for these projects, except to the degree that appropriations have already been made by this committee and by the Congress.

I think there is where the confusion and the difference and the controversy has arisen which the chairman, Mr. Cannon, has been questioning you on today. Authorizations and appropriations, as one phrase, they should not be tied together.

Now, that is put in as simple language as I can put it in.

Dr. LIBBY. I think I can agree with you, Mr. Jensen, but let me try to say it in my own words. It seems to me that the letter says that there was no substantive legislative action needed. I took that to mean an amendment to the 1954 act. We already had authority to construct research reactors under section 31 even though they might be large ones. We do have to seek the authority for an appropriation. There was never any misunderstanding about that.

Mr. JENSEN. You see, we never say authority for appropriation.

Mr. TABER. Well, they do use it in other committees.

Mr. JENSEN. We do not use the term here in this committee, do we, Mr. Taber?

Mr. TABER. No, not here.

STATUS OF POWER REACTOR PROJECTS

I want to call your attention to this chart No. XI with the amendment to it. (The amended chart, chart XI, is printed at page 97 of these hearings.) I do not know whether you have a copy of it or not. I would like to have you tell me the date that these different contracts were entered into. Do you have that information available handily?

Dr. LIBBY. Mr. Davis can give them to you more authoritatively, Mr. Taber.

Mr. TABER. All right, Mr. Davis.

Mr. DAVIS. On the first round we received proposals on April 1, 1955——

Mr. TABER. Which one is this?

Mr. DAVIS. That is for the Yankee Atomic Electric Co. We entered into a contract with them.

Mr. TABER. Is that the first one?

Mr. DAVIS. The first one under the power demonstration program is the Yankee Atomic Electric Co.

Mr. TABER. That was when?

Mr. DAVIS. We have entered into a contract.

Mr. TABER. When was that?

Mr. DAVIS. On June 6, 1956.

The second one under the first round was the Consumers Public Power District of Nebraska.

Mr. TABER. Yes. When was that?

Mr. DAVIS. We are still negotiating a contract with them.

The third proposal under the first round is that of the Power Reactor Development Co. and we are still in the process of negotiating a contract with them.

Mr. TABER. That is the Detroit Edison job?

Mr. DAVIS. That is Detroit Edison & Associates.

Mr. TABER. Which round is that in?

Mr. DAVIS. That is in the first round.

There was a fourth proposal in the first round which was Commonwealth Edison but that was later converted to a straight license application.

Mr. TABER. When was that?

Mr. DAVIS. Their proposal was received along with the others on April 1 and a construction permit was recently issued to them.

Mr. TABER. About when?

Mr. DAVIS. It was on May 4, 1956.

Mr. TABER. Now, this Consolidated Edison: What can you tell me about that?

Mr. DAVIS. The Consolidated Edison was an application for a license only. It involved no contract with the Commission and a construction permit was given them on May 4, 1956.

Mr. TABER. There was this Duquesne job. When was that?

Mr. DAVIS. The Duquesne job was a contract between the Commission and the Duquesne Light Co. The contract was entered into some time early in 1954 and I don't have the exact date.

Mr. TABER. What about this Argonne Laboratory job, 5,000 kilowatts, in Lemont?

Mr. DAVIS. That is a reactor experiment which was entered into under an amendment to the University of Chicago contract. Again I can not tell you the exact date.

Mr. TABER. Could you tell me the year?

Mr. DAVIS. That was some time in 1954.

Mr. TABER. Early or late?

Mr. DAVIS. I would guess that it was some time in the middle of the year.

Mr. TABER. Now the National Reactor testing station?

Mr. DAVIS. The experimental breeder reactor experiment No. 2?

Mr. TABER. Yes.

Mr. DAVIS. That again is carried out under contract by the University of Chicago which runs the Argonne National Laboratory for us and again it was done under an amendment to the contract with

them. I should not hazard a guess on this one because I don't know precisely when the contract was amended.

Mr. TABER. Could you give me even the year?

Mr. DAVIS. I think it was probably 1954.

Mr. TABER. Now, what about this Pennsylvania Power & Light Co.?

Mr. DAVIS. Pennsylvania Power & Light Co. is a proposal for a completely privately financed reactor on which they are now expending a great deal of money for research and development. They have not yet applied to us for a license for the construction of that reactor.

Mr. TABER. What about the second round setup? Are there any of them?

Mr. DAVIS. The situation on the second round proposals is that the Commission has approved going ahead with the contract negotiations with the Rural Cooperative Power Association.

Mr. TABER. Which one is that?

Mr. DAVIS. That is the Elk River reactor.

Mr. TABER. When was that?

Mr. DAVIS. The proposal was received on February 1 of this year. We had received a preliminary proposal in June 1955. They later submitted a revised proposal under the February 1 deadline. The Commission has approved our going ahead with the negotiation of a contract with them. We are, at the present time, in the process of exchanging drafts of contracts.

Mr. TABER. Any others?

Mr. DAVIS. The other one which the Commission has approved at the same time, namely, in April was for negotiation of a contract with the Wolverine Electric Cooperative Association of Michigan. We are also in the stage of exchanging drafts of contracts with them and hope that we will have a final contract fairly soon.

Mr. TABER. That is as far as you have gone at this time?

Mr. DAVIS. The Commission so far has not approved going ahead with any of the remaining five proposals in the second round.

Mr. TABER. Now, what do you have to say whether or not the Commission—I will ask this of the Chairman—has proceeded as rapidly as possible to procure and arrange for the development of nuclear power reactors and plants?

Mr. STRAUSS. I believe that we have, Mr. Taber.

Mr. TABER. There are several of these items that are listed on this exhibit that Mr. Davis did not refer to. How about it, Mr. Davis? Are those just in the negotiation process or what?

Mr. DAVIS. All of them that are covered in the first column, which are the Commission's experimental program, are all going forward at the present time, are either under construction or will be in the near future.

Mr. TABER. That is the Santa Susana plant?

Mr. DAVIS. The Santa Susana plant is nearing completion of construction. Construction has been completed on the homogeneous reactor experiment No. 2 at Oak Ridge.

Mr. TABER. Is that Oak Ridge job in operation?

Mr. DAVIS. No. The construction has been completed and we are now carrying out preoperational testing prior to going into operation.

Mr. TABER. Now the next one.

Mr. DAVIS. The organic moderator reactor experimental plant is presently under design and some construction work is underway or is just about to get underway at Idaho.

Mr. TABER. Now what about Los Alamos?

Mr. DAVIS. They are in the stage of carrying out laboratory experiments and have not yet started construction or the detail design of this experiment.

Mr. TABER. That applies to both of those?

Mr. DAVIS. No. It does not apply to the power reactor experiments Nos. 1 and 2. Construction is essentially completed on experiment No. 1. They have made some preliminary tests. They have all of the components on hand for the second experiment, and they are now in the process of assembling these. We should have both in operation some time this year.

Mr. TABER. The liquid metal fuel reactor?

Mr. DAVIS. We have recently entered into a contract or are entering into final contract negotiations—I don't believe the contract is signed yet—with Babcock & Wilcox to design, construct, and operate the liquid metal fuel reactor experiment. This will get underway very shortly.

Mr. TABER. The gas-cooled reactor has not been started?

Mr. DAVIS. No. We have several contractors making studies and preliminary experiments. We have not as yet selected a contractor for the experiment.

RATE OF PROGRESS IN DEVELOPMENT OF POWER REACTORS

Mr. TABER. I asked the Chairman my question, and I would like to ask it of the other Commissioners. Dr. Libby——

Dr. LIBBY. I think I remember your question, Mr. Taber.

Mr. TABER. As to whether or not you believe that the Commission has proceeded as rapidly as possible with these.

Dr. LIBBY. Yes, sir. My answer to the question is that I think we have done very well. I do not think that we have proceeded as rapidly as one might say was possible, but I think we have done very well. I think that if we had sacrificed other programs, such as the weapons program, we could have moved more rapidly in atomic power. I am sure you gentlemen would not suggest that. We think that the weapons program has highest priority. But with that qualification, Mr. Taber, I think we have done about all that we could. The reason is a simple one. We have the people working who are available at the moment. As I said to your committee the other day, the only way I can see to increase the number of people working on this program, speaking of engineers and scientists, is to get industry in the program on a wider base. The question is how you do this. We have been debating this for some days. I think we all agree that in order to broaden the program we have to get industry into it, either by the Government contractor route or by the partnership route. I prefer the partnership route for the reason I described the other day. I think they will give you the better men in doing this. Within the the limits of our manpower I think we have done as well as anybody could expect, and I think we lead the whole world in atomic power, and I believe that fervently.

Now, as to the question of whether or not we will continue to lead, that will depend entirely on how successful we are in getting more people into our program; and most of them are now in the employ of the private industries. So I think the answer to your question is a qualified "Yes," the qualification being that had we not considered the weapons program as sacrosanct, we could have done better.

Mr. TABER. Mr. Vance, what do you have to say on that question?

Mr. VANCE. I think, Mr. Taber, considering the present state of the art and considering the fact that as yet we do not know which 1, 2, or 3 of these various reactors which are now under study will finally emerge as the best from a commercial standpoint, the answer to your question is "Yes."

Mr. TABER. Mr. Murray?

COMMISSIONER MURRAY'S VIEWPOINT ON UNSATISFACTORY RATE OF PROGRESS

Mr. THOMAS E. MURRAY. Mr. Taber, I have expressed myself many times on this subject. I do not believe, under all the circumstances that we are now facing, that we are doing enough, and I believe that we could do a great deal more. I am convinced that it is important that we do a great deal more. That was one of the reasons why I suggested that the Government, in order to get on with this job, should move into the large power reactor field. I reach that decision on the basis that private industry is not prepared and has not the resources to carry on these large reactor programs which I, personally, believe are necessary.

Now, I would like to refer you, Mr. Taber, to the chart, No. XI (printed on p. 97). We put a lot of dates on those charts, as I tried to indicate to you the other day. I have looked over all of these dates. I have looked over the progress the various private utility companies are making and I have come to the conclusion, and I have made this a public record with the Joint Committee, that I do not believe we will get any substantial electric power in this country by 1960, except that which will come from the Shippingport reactor. I put into the record the other day the complete statement which I made before the Joint Committee. I do believe the program should be accelerated. I believe it must be accelerated in view of the weapons situation which we are now facing around the world.

Mr. TABER. You mean that we are not doing as well as we should with the weapons?

Mr. THOMAS E. MURRAY. I believe we should do more in the weapons field. I have been advocating a program of acceleration in the weapons field. I have been asking the Joint Committee for the manufacture of small weapons. I would be very glad to send you a copy of the statement I made before the Senate Subcommittee on Disarmament on that subject. I think our efforts in the weapons field must be accelerated. I have stated that to the Joint Committee.

Mr. TABER. Has this been a new departure on your part; that is, where you have felt that not enough was being done?

Mr. THOMAS E. MURRAY. No, sir.

Mr. TABER. How far back does it go?

Mr. THOMAS E. MURRAY. I could refer back to a statement that I made in 1954. This is no new idea of mine to get ahead with weapons and large power reactors.

Mr. TABER. Does the Chief of the Joint Chiefs of Staff control the progress of the weapons picture?

Mr. THOMAS E. MURRAY. I think the National Security Council controls it.

(Discussion off the record.)

Mr. TABER. What sort of change?

Mr. THOMAS E. MURRAY. It is a change from the policy of leaving the development of large power reactors to private industry.

Now could I go back, before I forget it, because I may. In September of 1954, before the International Convention of United Steel Workers at Atlantic City I made this statement:

> Because the economics of nuclear power are so uncertain, it is unrealistic to expect private industry to undertake on a purely risk basis anything like the effort that the world atomic problem demands. If our goal is electric power from the atom at an early date, the Government must continue to play the major role for the immediate years ahead. Only in this way can we assure that this potentially giant industry will arrive soon enough to be of any assistance in the attainment of peace.

I have repeatedly said that in similar words on many, many, occasions.

Mr. TABER. Do you mean by your statement that we will not have these contracts or licenses with the big utility companies to go ahead with?

Mr. THOMAS E. MURRAY. No, sir; I heartily support that program. I heartily support it and I asked that it be implemented. As a matter of fact, the other day I asked that funds be put back into the budget that would be of assistance to what we have been talking about here as the first and second rounds of the power demonstration program.

Mr. TABER. I think that is all I have on this.

DETROIT-EDISON REACTOR PROJECT

Admiral, I wonder if you can tell us what is the present status of the Detroit Edison group and their approach to the Security and Exchange Commission setup. Has there been any change in their activity at this time?

Mr. STRAUSS. I do not know, Mr. Taber. I attempted to inquire of Colonel Cisler, who has been spearheading this enterprise, I guess last Friday, and found that he was overseas. I was not able to reach him. I did, as a matter of fact, reach him but the telephone connection was so poor that we could not understand one another. I do not believe that they have made application to the Securities and Exchange Commission although testimony before this committee is more up to date than my information.

Mr. TABER. They had not at the time the SEC representatives were here, but we were told that if application was made and if it was in proper order then it probably would be approved.

Mr. STRAUSS. I presume that that means that the application had not been made.

Mr. TABER. That is correct.

Mr. STRAUSS. Then, as Commissioner Murray informed you 2 or 3 days ago, the reactor safeguard committee of the Commission has made a report to the Commission with respect to safety features of the reactor, which report is under study by the Commission at the present time.

The Commission has not acted upon the subject of the safety aspects of the proposed reactor and the Detroit Edison Co. and associates are waiting, as are many others interested in this business, on the action that is expected and hoped for from the Congress at this session on the bill to assist in the indemnification of third parties against the possibility of a reactor incident.

Mr. TABER. I think that is all.

Mr. THOMAS E. MURRAY. Could I add, Mr. Taber, one thing. In this chart No. XI do you see a date opposite the Detroit Edison reactor program of 1960?

Mr. TABER. That is correct. On the other hand, what would you have to say as to within what time it could be done?

Mr. THOMAS E. MURRAY. I am as sure as I am sitting here that you will not get the Detroit Edison reactor in operation by 1960. Now you can make it any other date that you want, but I want to point up, as Mr. Strauss has just stated to you, that the reactor safeguard committee in one of their statements says:

> It is impossible to say—

and they are referring to this Detroit Edison job—

> whether or not an accelerated program would give sufficient information to permit safe operation of this reactor at the Laguna Beach site on the time schedule presently proposed.

Now this is not in any criticism of the Detroit Edison effort. This is not in any criticism of the work that private industry is doing. They are doing a magnificent job. It is a question of how soon do you want to get real results from large breeder reactors. That is the heart of this whole situation. You have to make a judgment.

Mr. TABER. These reactors have to be built by the Commission, do they not, or under their direction.

Mr. THOMAS E. MURRAY. The design would have to be approved. That is why the Reactor Safeguard Committee has been brought in at this stage of the game to look over the designs of their construction and the type of reactor they intend to build. The Reactor Safeguard Committee has certain reservations.

Mr. TABER. Those same things would apply in connection with the construction that was underway on a Government setup?

Mr. THOMAS E. MURRAY. Yes, sir.

Mr. TABER. And those same delays would result? Perhaps more?

Mr. THOMAS E. MURRAY. No, I do not believe so. And the basis of my answer is that I believe the Government could afford to move much faster in areas that today are not proven out. I say that we should not wait until all these things are ironed out and all of the answers are down in black and white before we go ahead with this program. I have said it before, that if we go ahead with 3 or 4 of these large reactors 1 or 2 of them may be a complete failure. I recognize the possibility of that. I recognized that when I recommended the Shippingport reactor. I recognized that it would be uneconomic at first. I recognized that I had the opposition of everybody right down the line—I am repeating what I said the other day—for going ahead with the Shippingport reactor.

Mr. TABER. You mean everybody all the way down the line was opposed to it?

Mr. THOMAS E. MURRAY. Practically everybody; our General Advisory Committee was against it.

Mr. STRAUSS. That does not comport with my recollection, I am sorry to say.

Chairman CANNON. What would you say about that, Admiral Strauss?

Mr. STRAUSS. This is disagreeable to say, but I do not recall that Mr. Murray recommended the Shippingport reactor. My earlier testimony before the committee was an attempt to explain how that reactor came into being, and was located at Shippingport. Also your question of the individual Commissioners, Mr. Taber, has brought out a lack of unanimity on the question of public or private financing for this program. Now this lack of unanimity has developed since the 18th of January. Because on that date and as of that date Commissioner Murray was in line with the rest of us, in feeling that the building of reactors with Government funds was not the attitude of the administration and that he did not feel it should be done either.

Mr. THOMAS E. MURRAY. I take exception to that. That is why I quoted to you the passage from my earlier speech in 1954 to the effect that the Government must continue to play the major role in reactor development for the immediate years ahead.

Mr. STRAUSS. These are the records of the Commission as of that date. I did not happen to be present at the meeting but a transcript was made. I have given a general paraphrase of the transcript. Now this difference has developed subsequently. It is healthy that the differences should exist in the Commission but it did not exist prior to that date, not to my knowledge at any rate.

Mr. THOMAS E. MURRAY. In October 1954 we were making a report to the National Security Council on policy concerning reactors. I prepared a memorandum commenting on that report; in that memorandum I said:

> The most important single action at this time is authorization of an immediate acceleration of the AEC power-reactor program. The course of action proposed will in all likelihood be of doubtful value unless such action is taken. The NSC should be asked to authorize not a study but an action, namely, that we step up our power-reactor program.

Mr. STRAUSS. Nothing in there is said about public funds. With Mr. Murray's consent, I would read you the precise minutes from the transcript.

Mr. THOMAS E. MURRAY. I was commenting at that time on a news release that the Commission was being asked to give its comments on.

Mr. TABER. Let us have that other one.

Mr. STRAUSS. Mr. Taber, I will not do this without Mr. Murray's approval.

Mr. THOMAS E. MURRAY. You can have my approval of that.

Mr. STRAUSS. This is a colloquy between Commissioner Murray and a member of the staff:

> I am a little bit concerned about getting out some kind of figure that might be misleading. We would say in this country we intend to install X number of kilowatts by 1960 or 1961, by doing that I think you would be forced to build them with Government funds as of today. I don't think that is the attitude of the administration and surely I do not feel that we should be doing that.

Mr. THOMAS E. MURRAY. By "doing that," I meant making this public statement and thereby misleading the public. That is what I

was referring to. The question under discussion then was the release of a public statement. I said if we put it out the way it was then proposed we would be misleading the public because it was not national policy.

Mr. TABER. Is that a correct quotation from the minutes?

Mr. STRAUSS. This is from the reporter's transcript.

Mr. TABER. That is all I have.

COMMISSIONER STRAUSS' TENURE OF OFFICE

Chairman CANNON. I want to ask Admiral Strauss when he became a member of the Commission.

Mr. STRAUSS. I was invited to become a member of the Commission by President Truman on July 31, 1946. I was sworn in when the Commission convened in the late fall.

Chairman CANNON. I am speaking of your present tenure.

Mr. STRAUSS. Today is the third anniversary of my taking the oath as chairman on the 3d of July 1953.

Chairman CANNON. You were a member of the Commission at the time they first brought up the Shippingport proposition?

Mr. STRAUSS. I was.

Chairman CANNON. Without objection, the committee will stand adjourned until 2 o'clock.

AMERICAN CAPACITY TO BUILD ATOMIC ELECTRIC POWER PLANTS

Chairman CANNON. The committee will resume.

We were discussing, Commissioner Murray, the progress being made and the needs of the program. I would like to ask about another citation from the hearing before the Joint Committee on Atomic Energy, in March of this year.

Mr. PHILLIPS. The clerk advises me this is not the same book of hearings we had this morning, which covered the May hearings.

I beg your pardon, Mr. Chairman, I have the correct book.

Chairman CANNON. In this hearing we seem to have conflicting views on the part of members of the Commission. Dr. Libby said in response to a question from Senator Pastore:

> I certainly agree that industry response is very heartening. I think there is an aspect to this whole problem which should be brought out in our discussion. The critical matter in the development of atomic power, I believe, is not money nor uranium, but it is technical manpower necessary to solve the problems. These men are in large part employees of private industry. So even if we proceed with a Government-financed program, we still have to get these companies to build the plants in order that we get the men they have on their payroll to work on them.
>
> It seems to me that we get a more wholehearted effort if we do have a company with its money on the line, its reputation at stake, and its whole interest in the development of the project. I am not in any way criticizing our industrial contractors in any part of our program. We have had wonderful service from them. But I think it is still true that the men of highest ability who are in great and vital demand for the country's normal business are more likely to be brought to bear on the atomic power program if the company has it own money in it.
>
> This is one feature of the program I wanted to bring out. It is an important one from my point of view. I like to see the companies enter into the wholehearted or at least a full partnership with the Government.
>
> However, if it should develop that some aspects of our program should lag, then I believe we should go ahead with public funds. But I think we can wait a while on this. The signs look very good. I am very encouraged.

On the following page, page 344, Senator Pastore again puts the same question, this time to Mr. Murray. He said:

How do you side that up with what Dr. Libby has said, that there are just so many technicians and scientists and whether they are working for Government or private industry, you just have so many minds and so many hands. Would you expect the situation to be different because the Government takes it over? What have you got to say on that, Mr. Murray?

and Mr. Murray answered:

I recognize as everyone on the Commission recognizes the shortage of manpower to get jobs done. I do believe once you made up your mind that you had to have this job done on a schedule with established goals that the manpower would be forthcoming. It is all right to theorize that there is not enough manpower to go around. There are not enough scientists, and so on. We need a great many more scientists. But you put this up to the American public and say to them and American industry that this job has to be done, and here is the goal you have to reach, American industry will do it with the funds being put up by the Government. There is no doubt about it.

Commissioner Murray, have you changed your mind on that in any respect?

Mr. THOMAS E. MURRAY. No; I have not, Mr. Chairman.

Chairman CANNON. You still think the obvious thing to do is to go ahead; that we learn to do by doing; and that if we go ahead we will have sufficient manpower; that we do not have to wait for manpower?

Mr. THOMAS E. MURRAY. I think by going ahead with a vigorous large industrial atomic program that you will bring new companies and new manpower into this picture and you will in that way educate new people in this science of building and operating reactors. If we are going to wait for the development of the manpower to do all of these things, we have a long, long time to wait.

Chairman CANNON. Is there any indication that Russia is waiting?

Mr. THOMAS E. MURRAY. As I said the other day, I have no authoritative information on that situation. We have a lot of statistics given to us in the newspapers and magazines on the number of technicians and number of scientists they are producing year after year, and we are told that by a certain date they will be way ahead of us in the production of scientists. But, as I said, I have no way to really judge that.

Chairman CANNON. But at least you would say that it is a matter of such serious import that we cannot afford to take any chances?

Mr. THOMAS E. MURRAY. I do; yes.

Chairman CANNON. We were discussing at the last hearing, Commissioner Murray——

Mr. THOMAS E. MURRAY. Just in that connection——

Chairman CANNON. Yes, if you will.

Mr. THOMAS E. MURRAY. I have here a newspaper article from the Washington Daily News.

Senator Anderson recently read this into the record of the Joint Committee hearings, indicating the number of firms that would be very much interested in getting into this program and contributing what they could to building large scale reactors. I do not think it is necessary to read the complete article, but it is an indication that once we make up our minds, and once money is appropriated, and once we decide to go ahead with a large development of power reactors, you will be able to enlist a great many other companies which are not now in the program.

Chairman CANNON. We will insert at this point in the record the item referred to.

(The information is as follows:)

[The Washington Daily News, Tuesday, June 26, 1956]

FROM MOST FIRMS IN UNITED STATES, SURVEY SHOWS REACTOR PROJECT GETS O. K.

By Marshall McNeil, Scripps-Howard Staff Writer

Proof that there is some private capacity for building atomic power reactors is tucked away in a printed hearing made available by the Joint Congressional Atomic Energy Committee.

This may be a factor when the committee meets tomorrow for a scheduled vote on whether to order the Atomic Energy Commission to speed up this country's effort to produce electricity by nuclear fission.

The bill before the committee, a re-write of that originally proposed by Sen. Albert Gore (D., Tenn.), has two other purposes. It is intended to implement President Eisenhower's atoms-for-peace plan; and it is expected to complement AEC's present reactor construction program carried on in "partnership" with private industry, principally, electric utilities.

IMPLICATIONS

The Joint Committee had been confronted in earlier sessions with at least the implication from AEC officials that an additional government reactor program would be a drain on scientific and other manpower. There was the hint that perhaps private capacity to undertake new atomic projects was limited.

For example, Sen. John Pastore (D., R. I.) asked AEC chairman Lewis Strauss: "* * * Could you successfully carry out a full-fledged private enterprise development in this * * * field and still have the government building six plants of its own * * * Would you have enough technicians and scientists or would one have to sacrifice to the other?"

Adm. Straus replied: "We think that is a sacrifice and that is a matter of opinion, of course * * * We think that there is a short supply of the kind of skills that we would have to divert people from research and development, which we believe is more important."

Wires

So, Sen. Clinton Anderson (D., man, wired 42 potential industrial contractors of national reputation as to whether they could undertake responsibility for an additional reactor program.

His specific question was: "If the government undertook to design and construct one or more additional prototype reactor projects, is your firm qualified to assume full responsibility for carrying on such a project under prime contract or subcontract. * * *"

The majority of the 39 firms that answered regarded themselves as fully qualified to take the responsibility for atomic power reactor construction as prime contractor. In this group were such firms as these: ACF Industries, Inc., New York City; Allis-Chalmers Manufacturing Co., Milwaukee; Austin Co., Cleveland; Bechtel Corp., San Francisco; Blaw-Knox Co., Pittsburgh; Consolidated Western Steel, a division of U. S. Steel Corp., at Maywood, Calif.; Dravo Corp., Pittsburgh; J. A. Jones Construction Co., Charlotte, N. C.; Kaiser Engineers, Oakland, Calif., Vitro Engineer Engineering Co., New York City.

Some other companies suggested they would share such a job with others, and a few said they weren't prepared to go ahead. In this latter group were these firms:

Fairbanks, Morse & Co., Chicago: "We would say that we would not be qualified to assume responsibility for carrying on a project in connection with prototype reactors as a prime contractor."

Kopper Co., Inc., Pittsburgh: "* * * It will take some time before we can be qualified to assume full responsibility for carrying out such a project under a prime contract * * *."

Turner Construction Co., New York City: "We are not qualified to design or operate reactor projects but we are confident that we are well qualified to construct such facilities from designs prepared by others."

REDUCTIONS IN ESTIMATES FOR POWER REACTOR DEVELOPMENT SHOULD BE RESTORED

Chairman CANNON. At the last hearing we were discussing with you the amount of appropriation and the fact that $60 million had been cut off the amount requested by the Commission; $40 million for operation and $20 million for construction. If I understood you at that time you took the view that you needed this $60 million originally requested and that the addition of this $60 million would be a material help in accelerating the program.

Mr. THOMAS E. MURRAY. That is right, Mr. Chairman.

Chairman CANNON. What is the basis for your opinion on that, Commissioner Murray?

Mr. THOMAS E. MURRAY. I still feel that I would like to see this Committee put in the original estimates that our staff had prepared for the supplemental budget.

Let me put it another way. We have been cut some $40 million in operating funds and $20 million in construction funds.

Mr. PHILLIPS. Cut or cut to?

Mr. THOMAS E. MURRAY. Cut by that amount, Mr. Phillips.

Chairman CANNON. And to that extent you think you are handicapped in carrying out the work?

Mr. THOMAS E. MURRAY. I do. I think that if this money were put back into the budget that it would do a great deal to accelerate our power development program.

Chairman CANNON. The consummation to be devoutly wished at this time.

On the strength of your statement last Friday, our counsel looked into the matter, and now proposes that a $40 million increase be made in the item on page 160 listed as "Increase for Power Reactor Demonstration Program". The figure $10 million would be changed to $50 million.

Mr. THOMAS E. MURRAY. That would put the $40 million back that I would suggest be put back.

Chairman CANNON. Would you still approve of that increase?

Mr. THOMAS E. MURRAY. I would recommend that it be done.

Chairman CANNON. And then our counsel, studying this question, since our last session took up the question of providing the increase in construction funds, say, on item 15 on page 214 of the budget estimates; that item 15 on page 214 of the budget estimates be changed from $15 million to $35 million, or, in other words, be increased by $20 million. Would that bring it up to the amount originally recommended by the Commission?

Mr. THOMAS E. MURRAY. It would, yes, Mr. Chairman.

Chairman CANNON. Do you think that——

Mr. THOMAS E. MURRAY. I think in addition you would have to have necessary authorizing legislation to do that.

Chairman CANNON. Authorizing legislation?

Mr. THOMAS E. MURRAY. For the construction.

Chairman CANNON. But if we had the legislation and if we made that increase, you think the program would be fully benefited to that extent?

Mr. THOMAS E. MURRAY. I think there is no doubt about it.

AUTHORIZATION OF $400 MILLION FOR POWER REACTORS

Chairman CANNON. Returning to newspaper comment on the subject, there is an editorial on the editorial page of the Washington Daily News of June 30, 1956, which starts out:

ATOMS FOR PEACE

With healthy bi-partisan backing, and no dissenting votes, the Joint Congressional Atomic Energy Committee has approved a great new program intended to keep this country ahead in using the atom for peaceful purposes.

With that in view the Joint Committee reported out a bill last Friday, as this newspaper article says, by unanimous vote of the Joint Committee, authorizing the sum of $400 million for the acceleration of the construction of civilian power reactors.

Do you think that much money could be used for that purpose advantageously at this time?

Mr. THOMAS E. MURRAY. I surely do.

Chairman CANNON. Do you think our program would be retarded by lack of sufficient funds if that item is not included for the coming year?

Mr. THOMAS E. MURRAY. I do, Mr. Cannon.

Chairman CANNON. Returning to your testimony of the last day the Committee was in session, I got the impression that you believed $60 million should be restored to the Commission's budget even if the additional $400 million authorized by the bill now pending in the Senate is appropriated. In addition to the $400 million do you think the $60 million could be used advantageously?

Mr. THOMAS E. MURRAY. I do.

CHANGE IN NATIONAL POLICY NECESSARY

Chairman CANNON. What other suggestions have you along that line, Commissioner Murray?

Mr. THOMAS E. MURRAY. Well, I do not know whether this is the place to discuss it, but——

Chairman CANNON. Anything in this connection is in order.

Mr. THOMAS E. MURRAY. You can appropriate, of course, $400 million to this Commission and at the end of 12 months not get very far unless our whole thinking and our whole program is reoriented to the problem of getting on and spending this money and getting on and building reactors.

Chairman CANNON. Merely providing the money does not mean progress unless the money is properly utilized. You can have the finest machine in the world and unless it is operated by someone who knows how to handle it and is interested in getting maximum results, the machine, regardless of its advantages, will not be worth very much.

Mr. THOMAS E. MURRAY. Yes. And, Mr. Chairman, in that connection, when I announced the decision of the Commission to go ahead with the PWR project—this was October 22, 1953—in that announcement I had this to say:

Supervision of the project has been delegated to our Reactor Development Division. The director of this division, Dr. Laurence R. Hafstad, has assigned the immediate responsibility for the job to Rear Admiral H. G. Rickover, the naval reactor expert. Some of our friendly critics have been reported as having

been somewhat concerned about the psychological effect of a Navy man in charge of this first industrial reactor construction, Let me tell you that this choice was based solely on the Admiral's unique experience and accomplishments in building a propulsion power reactor for the Commission and for the Navy, We have assured ourselves that the only Navy aspect which the Admiral will bring to this work is his title.

His title as "Admiral".

Chairman CANNON. Yes.

INADEQUACY OF AEC IN REACTOR DEVELOPMENT DIVISION

Mr. THOMAS E. MURRAY. Now, some sort of approach of this kind I believe is essential if and when this money is appropriated to go ahead to build these three large or whatever number of reactors we build. Our organization as such in the AEC as it is now constituted is not able, in my judgment, to take on the responsibility of not only following this job but seeing that it comes through on time. Whether we assign it to the Naval Reactor Branch or whether we assign it to a new branch that might be established, I believe action must be taken by the Commission if this legislation is passed to set up an organization to see that its main and sole purpose is to build these reactors.

Chairman CANNON. I got the impression when Admiral Rickover was before us recently that there was no man today who had behind him such a record of actual accomplishment and achievement as Admiral Rickover, and that his extraordinary success in building the *Nautilus* marked him as an outstanding man in that field.

You think, then, that if this $400 million and this $60 million were provided, if it were placed in Admiral Rickover's charge he could and would get results?

Mr. THOMAS E. MURRAY. I do; at least on two of them. If we decide we had to build three big ones, if you turn two over to the Naval Reactor Branch I believe you would get results.

Chairman CANNON. Admiral Rickover is a very busy man. He is building the reactor at Shippingport. And you testified this morning that Shippingport is the only station which will be producing power by 1960. Did I understand you to say that?

Mr. THOMAS E. MURRAY. That is right. That is my best judgment.

Chairman CANNON. Would he have time and the opportunity, along with his other responsibilities, to take over the administration of this $400 million?

Mr. THOMAS E. MURRAY. I believe he would. He would have to expand his personnel and his whole organization.

Chairman CANNON. The Committee Counsel reminds me that the Shippingport reactor will be completed by 1957.

Mr. THOMAS E. MURRAY. That is right. But, there is a lot to be done after you complete it, you know.

Chairman CANNON. He at least will be footloose at that time and will be in a position to take over further work of this character?

Mr. THOMAS E. MURRAY. Well, he also has a large Navy program, of course, placed under his charge; but I do firmly believe that an expansion of this general idea is the only way you can efficiently spend these amounts—that is, at the moment. We might be able to develop some other ideas later on, but at the moment Admiral

Rickover's operation is the only place I feel we could turn to be sure that these large reactors would be built and built within the reasonable future.

CONGRESSMAN MURRAY APPROVES CHAIRMAN'S HANDLING OF INQUIRY

Chairman CANNON. You do not think there is any man with experience and capacity to do any better job than he could on that program?

Mr. THOMAS E. MURRAY. I do not know of anyone, no.

Chairman CANNON. This morning we had reached Mr. Murray on the list of committee members when we adjourned, but I have not had opportunity to recognize him. At this time I recognize Mr. Murray of Illinois.

Mr. JAMES E. MURRAY. Mr. Chairman, the questions that I had were cleared up during the lunch hour by our staff.

However, there was a statement on the record in connection with the manner of questioning made by our colleague, Mr. Jensen. I was present during the questioning. I just wanted to make the record clear that I do not concur in Mr. Jensen's statement. I felt from an observation of the questioning that the questioning was most fairly conducted and most capably conducted and has brought a great many facts into the record which could not have been brought out had the questioning not been conducted in such a manner.

Chairman CANNON. I thank the gentleman for his very generous comments. Are there further questions?

Mr. PHILLIPS. What does the chairman mean by "further questions"? Does he mean we shall cover the ground on this specific point?

MERCHANT SHIP REACTOR

Chairman CANNON. There are two more brief matters if the gentleman will permit, which we will take up at this time.

If the committee will turn to page 72 of the justifications, you will see item No. 10, nuclear powered peace ship reactor core.

As I understand it, this item is based entirely on the assumption that Congress will authorize such a ship.

Admiral Strauss, is it your assumption and expectation that Congress will authorize such a ship?

Mr. STRAUSS. It is my hope. Perhaps "assumption" is too strong a word. There is a short statement which the general manager has prepared on this subject—just a paragraph. This might be an appropriate moment, if you will permit, to introduce it.

Chairman CANNON. We will hear from General Fields.

Mr. FIELDS. Both the House and the Senate have passed bills authorizing the construction of a nuclear-powered merchant ship. Now, the budget was prepared in anticipation of authorization for a nuclear-powered peace ship in fiscal year 1956 and $21,000,000 in plant and equipment appropriations were earmarked for this purpose.

The Senate version of the bill authorizes appropriations to be made to the Maritime Administration and to the Atomic Energy Commission. If the Senate version is passed, these funds will be required to meet our responsibility for the construction of the reactor for the merchant ship. This also applies to the $3,500,000 under "operating expenses" here which was budgeted for the reactor core for the peace ship.

Chairman CANNON. However, General Fields, in event that the ship is authorized by the Congress, what would be the source of your funds for the reactor for the ship? As I recall it, you provide money for the core, but you do not provide funds for the reactor.

Mr. FIELDS. The money in the operating budget is for the core. As I said, legislation on a nuclear-powered peace ship was being considered when we prepared the budget in 1956, so we earmarked $21,000,000 for that purpose in the event it passed. If not, it would not be utilized.

Chairman CANNON. As a matter of fact, the $21,000,000 has not been appropriated, has it?

Mr. FIELDS. Could I ask Mr. McCarthy to answer that question?

Mr. MCCARTHY. At the time of preparing our 1957 budget last fall, Mr. Chairman, there were balances available to the Commission under the plant and equipment appropriation, and at that time, in view of the possibility of authorization for a merchant ship or a peace ship, there was reserved $21,000,000 as set forth in the President's budget. In the performance statement it was set out, that in 1956 there was $21,000,000 being held on the assumption that such a ship would be authorized.

Chairman CANNON. Last year we failed to appropriate this money. This year it is not in the budget, or is it?

Mr. MCCARTHY. Yes, there is in the 1956 funds, Mr. Chairman, $21,000,000 which is available to cover the cost of the construction of such a reactor.

Chairman CANNON. Money provided last year?

Mr. MCCARTHY. Sir, in the 1956 appropriation, the committee did not provide money for this because at that time authorizing legislation had not passed. The Commission at the time the 1957 budget was prepared last fall had balances available of which some $148,000,000 had been applied to the 1957 appropriation. In addition, $21,000,000 was not applied at that time, but rather was held in the event that an authorization for a ship was passed. This did not happen. However, as General Fields points out, bills have been passed by the House and by the Senate and are now in conference.

Chairman CANNON. Apparently you are merely trying to take this out of unexpended balances without specific appropriation. Is that what you are trying to do?

Mr. MCCARTHY. This is set forth in the performance statement, and I think it is included in the subcommittee print.

Chairman CANNON. The money was not appropriated last year, and you are proposing to take it out of unexpended balances this year. Apparently you are going ahead without the Committee on Appropriations having passed on it at all.

Mr. MCCARTHY. This was to be brought to the committee's attention this year in this presentation. That is the reason why the general manager mentioned this before the hearing closed. Also, in the subcommittee print there is mention of the fact that $21,000,000 is available. So it has come to the committee's attention.

Chairman CANNON. I do not believe it has come to us in the nature of a recommendation to appropriate $21,000,000 for this purpose.

Mr. MCCARTHY. It is not set forth as a new item in 1957; that is correct.

Chairman CANNON. You surely would not go ahead and attempt to use it for that purpose.

Mr. MCCARTHY. Not unless the committee took action on it; no, sir.

Mr. FIELDS. Mr. Chairman, I believe you will recall that last Friday the Chairman indicated to Mr. Donnelly he did have a statement he wanted to make on a matter, and this is the matter on which he was going to make the statement. We had not gotten to it.

Chairman CANNON. Was the statement in the nature of a request?

Mr. FIELDS. Yes, in the event there is passage of the Senate version of the bill authorizing the nuclear-powered merchant ship.

Chairman CANNON. What confuses the committee is the different ways in which you have treated these two items. Here is one for the core, and you have set it out as section 10 on page 72 of the justifications. Why did you not process the request for funds for the reactor in the same way?

Mr. MCCARTHY. This was all a matter of timing, Mr. Chairman. The core itself, of course, was not needed until 1957. At the time that we made up our budget last fall we hoped we would be before the committee much earlier. It also appeared in the spring that such an authorization would pass, and we would have been able to call the committee's attention to it at an earlier date.

ATOMIC ELECTRIC POWER FROM SEAWOLF

Chairman CANNON. We would like to have a word from the Commission, Admiral Strauss, on the *Seawolf* reactor. The reactor is located at West Milton, New York, and in January 1955 you notified publicly-owned utilities that this power would be sold. The public and cooperative groups have preference and priority rights under section 44 of the 1954 Atomic Energy Act.

On June 29, 1955, you established a price for the power, at 3 mills per kilowatt-hour, and the public power organizations referred to are entitled to priority under the 1954 law. Power organizations entitled to prior use of this power include the New York State Rural Electric Cooperative Association, the Board of Light Commissioners of the City of Ilion, New York, and the Municipal Electric Association of Massachusetts. Under the law they are entitled to priority, but there were inexplicable delays. What was the occasion for delay in the privileged organizations securing this power?

Mr. STRAUSS. I know of one reason. I do not know if it is the only one. They had not at that time made arrangements, nor do I believe they have yet made arrangements, for the transmission of the power from the plant to their own distribution system. They would have to either build lines, or use lines belonging to a private utility.

Chairman CANNON. In other words, they have not provided for wheeling?

Mr. STRAUSS. I think that is the technical term that is used which I avoided using because I am not a technician.

Chairman CANNON. So in the meantime you allocated this power to Niagara Mohawk.

Mr. STRAUSS. We sold power to the Niagara Mohawk.

Chairman CANNON. At three mills per kilowatt hour?

Mr. STRAUSS. That is right.

Chairman CANNON. But the understanding was that upon provision of wheeling facilities this power automatically would go back to the public power organizations entitled to it under the law?

Mr. STRAUSS. I do not know if that was automatic or not. I would have to ask counsel to state the precise nature of the contract. I believe the contract was a very short-term contract.

Mr. FIELDS. It calls for a 15-day cancellation, as I recall.

Mr. MITCHELL. The contract called for cancellation on 15 days' notice for the convenience of the Government. This meant that we did not have to assign any reason for the cancellation. That contract, I believe, expired in December. In the meantime, this gave these preference groups an opportunity to contract with us to by the electricity at the bus bar with a period after that for making their wheeling arrangements. However, none came in on this basis.

Chairman CANNON. Have these cooperatives been provided with wheeling facilities?

Mr. MITCHELL. No, sir. We gave them an opportunity.

Chairman CANNON. They are not yet in a position to accept this power?

Mr. MITCHELL. We gave them an opportunity, Mr. Chairman, to contract with us to buy at the bus bar, and then have a reasonable time after that for making their wheeling arrangements, and they did not propose such a contract to us.

Chairman CANNON. When they do comply and make application, the power is ready for them?

Mr. MITCHELL. What the Commission is proposing, Mr. Chairman, is a new contract with Niagara Mohawk again containing a 15-day cancellation clause, such as we had before.

Chairman CANNON. It might be, depending upon the time within which they make application, but clearly, under the 1954 law, these three public power cooperatives are entitled to the power if they are in a position to take it?

Mr. MITCHELL. Yes, and the Commission has recognized that, sir.

Chairman CANNON. And automatically, on the provision of such wheeling facilities you would be in a position to turn it over to them?

Mr. MITCHELL. The contract is not automatic. The Commission has the right to give this notice in 15 days without assigning any cause, which would then put the Commission in a position to sell otherwise.

Chairman CANNON. What is the expectation of the Commission? Do you intend, when they are prepared to take it—when they have wheeling facilities—to divert it to them instead of Niagara Mohawk?

Mr. MITCHELL. I think the Commissioners themselves could best answer that question.

Mr. STRAUSS. I think the answer is yes. It is imposed upon us by the law. I think you would be interested to know that one or more of these companies not only wanted the Niagara Mohawk to wheel the power, but since it is not firm power, to sell them firm power.

Chairman CANNON. The reactor is operated primarily for research and development?

Mr. STRAUSS. That is right.

Chairman CANNON. And this means that there are frequently irregular shut-downs and wide fluctuations in the power available.

Mr. STRAUSS. That is right.

Chairman CANNON. You were paid 3 mills per kilowatt hour by Niagara Mohawk.

Mr. STRAUSS. For a very short time.

Chairman CANNON. What would you receive from these cooperative groups?

Mr. STRAUSS. I presume the price is the same.

Mr. FIELDS. Three mills.

Chairman CANNON. Three mills, either to the Niagara Mohawk or to the cooperatives?

Mr. STRAUSS. Yes. As a matter of historic interest, Niagara Mohawk was prepared to pay us substantially more than that. The Commission set the price at three mills because that was the price we would sell it for.

Chairman CANNON. The most recent information the committee has on this subject is that of April 3, 1956, the Atomic Energy Commission entered into the contracts with the City of Holyoke, Massachusetts, and the village of Ilion, New York, for the sale of *Seawolf* power at 3 mills per kilowatt hour.

Mr. STRAUSS. That is correct.

Chairman CANNON. The caveat in this contract, so far as the Government is concerned, is that the municipalities were to be given only until May 1, 1956, to arrange for the transmission of nuclear power from the *Seawolf* to their own systems. What information has the Commission on that at the present time?

Mr. STRAUSS. They had since January 1955, if I am correctly informed, to make this negotiation.

Mr. FIELDS. Mr. Chairman, we entered into the contracts with them in February of this year. They had three months in which to make wheeling arrangements for the taking of that power. They were unable to make wheeling arrangements and that took them up to about the first of May, so they have been unable to make wheeling arrangements.

CHAIRMAN CANNON. Do they have plans on foot at this time by which they expect at a later date to be able to take advantage of it?

Mr. STRAUSS. I cannot answer that, sir, whether they have anything firmly on foot or not.

CHAIRMAN CANNON. They have not permanently relinquished their right to this power?

Mr. STRAUSS. They have not relinquished their rights. They did not ask for an extension of the contract, either of these companies.

Chairman CANNON. And at any time they are in a position to wheel the power, the power is waiting for them at three mills per kilowatt hour?

How are they being supplied in the meantime?

Mr. STRAUSS. We have no direct knowledge on these two companies. Presumably they make their own power or buy it. We have no dealing with them other than on the sale of our power.

Mr. PHILLIPS. They are existing companies, are they not?

Mr. STRAUSS. Yes.

Chairman CANNON. Is it true that Mr. J. D. Anderson, the Manager of the Schenectady operation, Atomic Energy Commission, asked the electric systems on January 13, 1955, if they were interested in the purchase of the West Milton atomic power and that he expected to get an answer over the telephone?

Mr. STRAUSS. I have no knowledge of that.

Mr. FIELDS. I am not sure as to the answer over the telephone. He did contact many firms within that area at that time. I believe that he asked for a reply within two weeks. I would have to go back and check the record on that.

Chairman CANNON. We understood he expected an answer over the telephone. Is it not true that the Atomic Energy Commission received a request from the Niagara Mohawk Power Company offering to purchase this power before it notified the preference customers of its availability?

Mr. FIELDS. I do not know. I would have to check the record on that.

Chairman CANNON. You may supply the answer later.

Mr. FIELDS. Before who notified the preference customers?

Chairman CANNON. The Atomic Energy Commission?

Mr. PHILLIPS. Let us be clear, what the question is.

Mr. TABER. The question was, if I am not mistaken, is it not true that the Niagara Mohawk communicated with the Atomic Energy Commission and offered to buy their power before the Atomic Energy Commission had communicated with the preference people. If that was so, it would not make any difference.

Mr. STRAUSS. We can supply an answer to that.

Chairman CANNON. You may supply the answer.

The information follows:

The Atomic Energy Commission on September 24, 1954 received a proposal from General Electric for the sale of West Milton power to Niagara Mohawk, which was prior to the issuance of a request for proposals by the Commission. It should be noted that the Commission subsequently directed the Schenectady Operations Office to contact other power groups within a one-hundred mile radius, both public and private, for an expression of interest and, if applicable, specific proposals for the purchase of the West Milton power.

Chairman CANNON. Is it not true that the Niagara Mohawk Power Company offered to pay 8 mills for this unfirm power while dump power in the area sells for an average of 3.5 mills?

Mr. FIELDS. It is true that they offered to pay 8 mills for it. I also believe that is substantially correct that dump power in the area has about that value.

Chairman CANNON. Why did Niagara Mohawk Power offer to pay this price for this unfirm power when they could purchase dump power for 3.5 mills?

Mr. STRAUSS. I submit that we cannot answer the question as to the motives of the Niagara Mohawk people.

Chairman CANNON. Is it not true that Mr. J. D. Anderson, the Manager of the Schenectady operation of AEC, notified the New York Rural Electric Cooperative on January 19, 1955, that he should be advised within the next two weeks, or sooner, if possible, whether or not you are interested in purchasing this power.

Mr. FIELDS. I do not know the exact date. He did have communications with the cooperatives in that area about that time.

Chairman CANNON. Is a two-week period sufficient for the rural electric cooperatives to carry out the difficult negotiations with their suppliers for the wheeling of this power, or for securing some economic benefits from it?

Mr. FIELDS. I believe that that inquiry was as to whether they were interested. I would have to check the record and get some assistance to establish what a fair market value would be.

Chairman CANNON. You may supply the answer.

The information follows:

On January 13 and 14, 1955, J. D. Anderson, Manager of the Schenectady Operations Office made telephone inquiries of three private power companies and 26 public power bodies within a 100-mile radius of West Milton for an expression of interest in West Milton Power. In these inquiries the utilities were told (1) that the power would be available by June 30, 1955 at the bus bar at the West Milton site; (2) that it would be non-firm, varying from 0 to 10,000 kilowatts with a total of 6,000,000 kilowatt-hours expected to be available annually; (3) that it would not be possible to guarantee the availability of any given amount of power; (4) that all of the available excess power would have to be purchased; and (5) that the purchaser would have to make all arrangements for transmission. They were asked to inform the AEC within two weeks if they were interested in purchasing the power. They were also told that the AEC expected to discuss with any interested parties the establishment of a rate. This telephone inquiry was confirmed by letter on January 17, 1955 to those organizations requesting confirmation.

Chairman CANNON. Is it true that the Atomic Energy Commission did nothing to assist that small rural electric cooperative in negotiating with the private power companies for the delivery of this power?

Mr. STRAUSS. What kind of assistance do you have reference to, sir—that we would represent them in the negotiation?

Chairman CANNON. Assist. Did you in any way assist?

Mr. STRAUSS. Do you mean whether we have been asked to assist in some way and have declined, or whether we volunteered assistance?

Chairman CANNON. Is it true that the Atomic Energy Commission did nothing to assist the small rural electric cooperatives in negotiating with the private power companies for the delivery of this power?

Mr. STRAUSS. Mr. Chairman, I would say that the Atomic Energy Commission has assisted neither side in a negotiation, and I would question our authority to do so.

Chairman CANNON. Your answer would be, Yes, it is true.

Mr. STRAUSS. To the best of my knowledge and belief, the Atomic Energy Commission has participated in no private negotiations between purchasers of power.

Chairman CANNON. Is it true that without such assistance the rural electric cooperatives lost most of their bargaining power?

Mr. STRAUSS. I cannot answer that question.

Chairman CANNON. Is it not true that without such assistance the rural electric cooperatives lost most of their bargaining power?

Mr. PHILLIPS. The question is not clear to the committee members here. How could they, one way or the other?

Chairman CANNON. What is your answer?

Mr. FIELDS. Mr. Chairman, I do not know the answer. I was not the general manager at that time. I would have to go back and check to see what did happen.

Chairman CANNON. Suppose that you do that.

(The information follows:)

The Commission's function in this matter, in accordance with the provisions of the Atomic Energy Act of 1954, is to make the power available at the reactor site. The matter of arrangements for transmitting the power from the site to the distribution system was necessarily a business decision of the purchaser of the power.

Chairman CANNON. Is it not true that the Atomic Energy Commission asked all interested parties to submit the price they would be willing to pay for such power, and you indicated "The best offer would appear to be a factor to be considered."

Does not this amount to preference to the highest bidder contrary the provisions of the law?

Mr. STRAUSS. Mr. Chairman, if such a proposal was made, we will supply it for the record, and the fact that there was no preference to the highest bidder, as has been demonstrated by this previous testimony of a few moments ago, is to the effect that the Niagara Mohawk bid eight mills and we set a price of 3.

Chairman CANNON. What is your reply, General Fields?

Mr. FIELDS. I would have to ask what the question was again, sir.

Chairman CANNON. Is it not true that the Atomic Energy Commission asked all interested parties to submit the price they would be willing to pay for such power?

Mr. FIELDS. As I recall, going back to this case, we did ask for opinions as to what the fair market value of dump power was in that area, in their estimation.

Chairman CANNON. And is it not further true that you indicated, "The best offer would appear to be a factor to be considered."

Mr. FIELDS. I would have to check to find that out.

Chairman CANNON. Suppose you do that.

(The information follows:)

This statement was made by Acting Chairman Libby in his letter to Clyde T. Ellis, Executive Manager, National Rural Electric Cooperative Association, of March 9, 1955. The full statement is, as follows:

"Section 44 of the Atomic Energy Act of 1954 provides little guidance as to what is a reasonable and non-discriminatory price where actual cost to the government will be more than any probable selling price. Certainly, under these circumstances the best offer would appear to be a factor to be considered."

At a meeting with representatives of the National Rural Electric Cooperative Association held on April 11, 1955, they were advised that the Commission had decided to set power prices after receiving proposals, taking into consideration bid prices received and the going rates for power of this nature. The National Rural Electric Cooperative Association representative stated at that time that they wished to make a study and submit to the Commission their recommendations as to a reasonable price.

Subsequently, after consideration of study recommendations from three interested preference organizations, plus consultation with the Federal Power Commission, a price of 3 mills was set as fair and reasonable under the circumstances.

Chairman CANNON. Also, does this amount to preference to the highest bidder rather than the preference provided under the act of 1954?

Mr. FIELDS. If you applied that factor, I presume it would, but we did not apply that factor. We set a price for the dump power at 3 mills on the advice of these companies, and the advice of the Federal Power Commission.

Chairman CANNON. Is it not true that the rural electric systems proposed a price of 3 mills for the West Milton Power as compared with the Niagara Mohawk proposal of 8 mills? You say that is true?

Mr. FIELDS. I believe that is true.

Chairman CANNON. And the Atomic Energy Commission on June 29, 1955, announced that the power would be sold for 3 mills. Is that true?

Mr. FIELDS. That is true.

Chairman CANNON. Why didn't the Atomic Energy Commission stick to its original intent and accept the highest bidder's offer?

Mr. FIELDS. I do not know as to the original intent, sir. That is the part I say I would have to check.

Chairman CANNON. You may check that.

Is it not true that from June 29, 1955, when the Atomic Energy Commission announced the selling price of 3 mills, the rural electric systems were given only 6 business days, not including Saturdays, Sundays or holidays, to work out some agreement with two unfriendly private power companies for the delivery of power?

Mr. STRAUSS. We will have to supply an answer to that. We have no chronology on that.

The information follows:

The Manager of the Schenectady Operations Office telephoned the three interested public power organizations, on June 29, 1955, informing them that a price of 3 mills had been established for the West Milton Power and requesting them to notify the Atomic Energy Commission by July 8 (6 working days) as to (1) whether they were interested in the power at the 3 mill price, (2) if so, how much they could use in their own systems, and (3) whether the transmission arrangements had been completed, and, if not, an estimate of the additional time required for this purpose. (This telephone conversation was confirmed by telegram to all three organizations.)

Chairman CANNON. Is it true that the rural electric systems offered to give the Niagara Mohawk Power Company 2 kilowatt hours of this unfirm power for one kilowatt hour of firm power and the power company refused to pass on to the rural electric cooperatives any economic benefit from this power in this manner, even in spite of the fact that they originally offered to pay two mills per kilowatt for the power?

Mr. STRAUSS. We cannot testify as to the details of negotiations between the public power companies and the Niagara Mohawk Company.

Chairman CANNON. You discussed with us just now the question of firm power and unfirm power. You are familiar with that.

Mr. STRAUSS. Yes.

Chairman CANNON. Why would you not be familiar with this?

Mr. STRAUSS. You asked about the details of a proposed offer, or trade between these companies. We were not participants in the negotiations and therefore I could not give you an answer to it.

Chairman CANNON. You were not participants. Were you familiar with it?

Mr. STRAUSS. No, sir. This is the first time I have heard of it.

Chairman CANNON. Once the Atomic Energy Commission entered into an interim contract with Niagara Mohawk for the purchase of this power, was there any reason why the power companies should continue to negotiate with the rural electric cooperatives for the purchase of this power to which the cooperatives were entitled under the preference clause of the Atomic Energy Act of 1954?

Mr. STRAUSS. The contract was terminable on 15 days' notice. Testimony was given to that effect. I should think that would have been notice to the contracting company that its contract was not a permanent or firm one.

Chairman CANNON. The Commission, by giving this power to Niagara Mohawk, thereby destroyed any incentive which they may have had in supplying these cooperatives.

Mr. STRAUSS. I think the record speaks the reverse. The contract terminated.

Chairman CANNON. Supplying wheeling power.

Mr. FIELDS. The contract with Niagara Mohawk was a short one which terminated in October. We then went back to the cooperatives and received proposals from them. In February of this year we did enter into agreements with them and let the contracts for the power. A short term contract was made last summer and it was terminated.

Chairman CANNON. July to October, 4 months?

Mr. FIELDS. I believe that is correct, sir. During that time very little power was delivered.

Mr. PHILLIPS. Three months.

Chairman CANNON. Is it not true that the rural electric cooperatives were unable to negotiate with the private power companies for the purchase of this West Milton Power once an interim contract was signed with Niagara Mohawk?

Mr. FIELDS. I do not know. We informed the cooperatives that that was a short term contract and would terminate.

Chairman CANNON. How much power has been sold to Niagara Mohawk under this contract?

Mr. STRAUSS. A small amount.

Mr. DAVIS. Twelve thousand kilowatt hours, I believe.

Mr. FIELDS. It was a small amount of power. I do not have the figure here, Mr. Chairman.

Chairman CANNON. Why was such a limited amount made available?

Mr. FIELDS. There was none other generated because of the experimental work. The reactor was on full power for only a very small amount of time while experiments were going on.

AMERICAN GENERATION OF ATOMIC ELECTRIC POWER IS DE MINIMIS

Chairman CANNON. Russia is boasting of the fact she has been delivering power steadily, consistently, dependably to consumers since June 1954. Why was such a small amount made available here?

Mr. STRAUSS. This plant was not built for that purpose. This is a prototype of a submarine reactor which was built for the purpose of testing such a reactor.

Chairman CANNON. That indicates how far behind we are. Russia is ahead of us in producing power to supply a community of ten thousand people and, as you say, this small and inconsequential amount is all that we can provide here.

Mr. STRAUSS. Mr. Chairman, you certainly have listened to the testimony about the submarine reactor at Arco, the reactor on the *Nautilus* and various others. Unfortunately this being an open hearing your words will go into the newspapers and contribute to giving a misleading impression to the American public. It is deplorable.

Chairman CANNON. Here is something else in an open hearing before the Joint Committee on Atomic Energy, May 1956, page 45. Speaking now about this Arco reactor "This reactor became critical on June 9, 1955, and on June 17, 1955, the town of Arco, Idaho, was connected by transmission line to the Borax powerplant. For 1 hour and 5 minutes electricity exclusively from this plant was furnished in Arco."

That is the plant you have been talking about.

Mr. STRAUSS. That is not the plant I described. That is not a submarine reactor. That is an experimental reactor.

Chairman CANNON. When we mentioned the plant in Russia, you reminded us that we had the Arco plant. The plant in Russia has delivered consistently sinc June 1954 for a community of ten thousand while this Arco plant served for one hour and five minutes.

Mr. STRAUSS. There are a number of plants at Arco. The plant to which I refer is the prototype of the reactor in the *Nautilus* and it has been running with the exception of time out to load fuel since March of 1953.

Chairman CANNON. It is tied in to nuclear reaction for the benefit of customers?

Mr. STRAUSS. It is the prototype of all the pressurized water reactors.

Chairman CANNON. We are speaking here of the energy that can be integrated into the local system.

Mr. STRAUSS. That is what the Shippingport reactor is.

Chairman CANNON. Made available for local consumers.

Mr. STRAUSS. That is the design of the Shippingport reactor of which the one at Arco is the prototype.

Chairman CANNON. Not merely talked about, or in blueprint stage, but in service.

What is the current status of this West Milton power?

Mr. DAVIS. The current status of the power is that we are getting into position where we could deliver some more power. Not the full amount but at least a part of it. The reason is that the experiment, itself, consumes some of the power and at the present time they do not want to operate at full power for several reasons. It is possible today to generate some power.

OTHER AEC REACTORS—AVAILABILITY OF POWER—TO WHOM?

Chairman CANNON. How does the AEC propose to carry out the preference provisions at the sodium graphite experimental reactor in California and the boiling water reactor experiment at Argonne National Laboratory?

Mr. DAVIS. On the sodium reactor experiment, again we invited those who are interested to make proposals for buying this power and the one proposal we got was from Southern California Edison. They proposed a price and it was determined that this was a fair price. The Commission then determined the price and a contract was entered into with Southern California Edison for them to purchase the heat and convert it into electricity.

Mr. PHILLIPS. Is that the Santa Susana plant?

Mr. DAVIS. Yes. With respect to the Argonne plant boiling water reactor, it is anticipated all the power from that will be consumed on the Argonne site.

Chairman CANNON. Are there further questions?

RUSSIAN PROGRESS IN ATOMIC ELECTRIC POWER PLANTS

Mr. PHILLIPS. I think the record should show clearly, following the statements that have just been made, that a reactor is in effect a

boiler and that whether or not it actually makes the electricity to light a city is less important than that we have proved continuous operation under economic conditions for the time the reactor has been in use.

To say that Russia has had a reactor in continuous operation lighting a city is certainly the opposite of information I have and certainly opposed to anything testified before this committee. It would not conform to known conditions in Russia, or how their statistics and statements correspond to actual operations. I think it would be a disservice if we were to permit, on our record, some statement which might be picked up by a newspaper, like some of the editorials which have been read in these hearings, and which were without foundation, that Russia is ahead of us, and that our program had collapsed. If Russia is ahead of us, we ought to know it, but we ought not to make statements in a hearing which are without support.

I would like to make inquiry about——

Chairman CANNON. I might say at this point, if the gentleman will permit, that Dr. Libby is on record in Congressional hearings as saying there is such a plant.

Mr. PHILLIPS. Who is on record?

Chairman CANNON. Dr. Libby. He made the statement in the Joint Committee hearings.

Mr. PHILLIPS. Are you on record before us, or any other committee, in saying that to your knowledge, or to the best knowledge available to you, that Russia has produced a plant which has continuously supplied power to light some city without a supporting plant operated by some other fuel?

Dr. LIBBY. The situation, as I understand it——

Chairman CANNON. Every plant has a stand-by plant. The Doctor made that statement before the Joint Committee.

Dr. LIBBY. It is my information—and I believe that I have been consistent in my testimony in all respects—that the Russians since May or June of 1954 have been operating a demonstration power plant of five thousand kilowatts, except for interruptions which are normal in any development plant of this sort. I think that the plant has worked well from all information I have. They have had to interrupt its operation for refueling and for the type of handling and repair which one would expect. But this plant is, so far as I know, a credible and worthwhile achievement. But it does not prove they are ahead of us. They could not by such evidence in any way establish that before a technical audience. They did not in Geneva, which was just such a technical audience with 54 countries represented and consisting largely of the world's leading engineers in this field. I would say without doubt that we won that competition. The Russians described their reactor in real detail. They were very open. It was very interesting to us and it is a very credible achievement. I think, however, you will find upon inquiry of the representatives of those countries which attended that it was America who stole that show and not Russia.

Mr. PHILLIPS. Then my second question is this——

Chairman CANNON. May I interpose there? Russia can truthfully say to the world that as early as June 1954 they did have a reactor that was producing serviceable power.

Dr. LIBBY. I think May or June of 1954.

Mr. PHILLIPS. A reactor of five thousand kilowatts.

Dr. LIBBY. Yes.

Mr. PHILLIPS. My second question is this: Is the actual production of electrical energy necessary to light a city the necessary criterion as to whether we are ahead? The testimony has repeatedly been before us here that a reactor is in effect a boiler, that you either use atomic fuel or you use coal or you use oil or whatever it may be, and that having produced and proved that we can put a reactor into action and continue it in action, that seems to me to be the essence of the evidence that we can do something with it. Am I right in that?

Dr. LIBBY. I believe in essence you are. I think there is a point in the proof of the power being economic to actually have it tied into a grid, but in the technical details you learn 99 per cent as soon as you get the heat to the turbine. That is, we have turbines for these plants which are very similar to the coal station turbines. We have something to learn by adding them on, however. This is the prototype stage where you go beyond the small plant stage. I think it would be well to tie them into grids at the last stage.

Mr. PHILLIPS. I am not defending us, as opposed to Russia or any country. I am trying to get some element of accuracy into this part of the record before it becomes public property.

Have we not, in the *Nautilus*, a reactor that is a power plant greater than five thousand kilowatts, the necessary production of five thousand kilowatts?

Dr. LIBBY. The answer to your question is yes, sir.

Mr. PHILLIPS. Then perhaps I could ask you on or off the record how many reactors have we at the present time which are producing kilowatts of energy, regardless of the amount? I mean how many?

Dr. LIBBY. The answer, Mr. Davis tells me, is three.

SEAWOLF ATOMIC ELECTRIC POWER

Mr. PHILLIPS. Now it seems to me if I may come back to this New York situation, which to the surprise of the committee, reveals that we are discussing a total of 12,000 kilowatt hours, which I think must have been about the amount of light we have used up in these hearings. In other words, we are involved in about $36 worth of energy or something like that. What I would think should be put in the record is the situation in New York State—and I am not familiar with that and I think probably my friend, Mr. Taber, is familiar with it—but my recollection as a man who has consistently supported the REA, my recollection is there is practically no public power in the State of New York, that if you took all of the energy supplied by public power in the State of New York as compared to that supplied by private power it would probably be less than 1 per cent of the power supplied in New York State.

I will ask Mr. Taber if that is correct. Then, if that is correct, then why all this furor of whether or not we have offered power to the Niagara Mohawk Power Company, or dealt with them, which company would, in turn, deliver this power to customers in the rural areas where the public power is not serving the area; then what causes all this furor over that, when the evidence is convincing that instead of putting the price at 8 mills, which Niagara Mohawk evidently offered—we actually put it at three mills which was the price

these almost non-existent public power companies offered to pay? I do not understand what the argument is all about and I will ask first, Mr. Taber, whether I am correct in my general statement that there is a minimum of public power; second, how many customers in your opinion, Mr. Davis, could be served satisfactorily with 12,000 kilowatt hours of power. First, Mr. Taber, if you please.

Mr. TABER. The REA in New York State is very considerably less than 1 per cent of the total area supply. The public power plants, there are not very many of them, Jamestown, Olean—there have been a dozen or so others that have gone out of business.

Mr. PHILLIPS. Mr. Davis, how many families in the rural areas of New York could have been supplied by 12,000 kilowatt hours of power?

Mr. DAVIS. I would have to make a guess, but I would say perhaps three or four families per year.

Mr. PHILLIPS. It seems to me we have a very great deal of heat in these hearings, with a small amount of resulting light and knowledge.

NEED FOR LARGE REACTORS

Now I am interested in this. I direct my questions now to Mr. Murray, if I may.

It appears to me that we are proposing on the one hand to bring into a development program either the private utilities, industry, the utilities and all of that who have scientists, who have knowledge, money, know-how, and to whom we have in fact turned in the past when we wanted to develop atomic energy. They would produce plants which would be, in effect, still in the experimental stage to see if they will work, of a hundred to two hundred thousand kilowatts, whatever the size would be, large plants. On the other hand, we could create a lot of little plants of five thousand kilowatts. The large plants would presumably be located where the power could be used in community distribution and absorption. In the little plants they are to be located at our plants which are not necessarily located near big communities where the power would be used, such as it is, in small amounts. We could use a combination of this idea. Suppose we were to adopt the suggestion, which I draw out of some of the interrogation, that we should not deal with the large plants until the Government has built these little plants and tried them out.

Mr. Murray, if you are the one who supports that theory, it seems to me that we would, after a length of time, end up exactly where we are now; that we would then, at some future time, have to go to the large utilities, the large manufacturers of power equipment and everything else, and start then where we are starting now. Since your testimony has repeatedly said that time is important, I cannot grasp the reason for recommendations that we should have a crash program carried on by the Federal Government when we would be so much farther ahead, on the testimony, to use the know-how, the scientists, the facilities, the equipment which would give us a big experimental impetus now.

In other words, if we adopt the crash program idea, we would handicap ourselves, and five years from now, or four years from now, we would be less far ahead than if we carried out the program recommended by what I gather to be the majority members of the Commis-

sion. I do not get your point and I ask you directly: Would we not handicap ourselves if we were to adopt the crash program, as compared to what I will call the Commission program?

Mr. THOMAS E. MURRAY. Mr. Phillips, first of all the recommendation has been that we place these large reactors at our production sites, the very large ones, where today we are using large amounts of energy. So we might place a plant at Oak Ridge, Paducah, Portsmouth, Hanford, where great quantities of electricity is being used. Any electricity that would be developed from these large reactors would be pumped right into our own system for the production of weapons material.

Mr. PHILLIPS. But not into a grid serving the community?

Mr. THOMAS E. MURRAY. No, sir.

Mr. PHILLIPS. We would not have the knowledge that we most urgently need and which on the Chairman's last questioning appears to be most important to him?

PRIVATE POWER VERSUS PUBLIC POWER NOT AN ISSUE

Mr. THOMAS E. MURRAY. Of course, the suggestion that we place these at large production centers stems from me because I was trying to avoid the public versus private power issue and to get on with the technology of large reactors. So my suggestion was that these reactors be placed at our large production sites that we could operate a 150 thousand kilowatt machine for two days, shut it down, we could operate it for another two weeks, shut it down, and we could go through all sorts of experimentation and not interfere in any way with the overall production of our plants and avoid this public versus private power issue.

Mr. PHILLIPS. It seems to me if we were to operate a plant two weeks and shut it down and do something else with it, we would not necessarily be finding out about the economic advantages or possibilities of continued production of power.

Mr. THOMAS E. MURRAY. I am only suggesting that you might have to shut it down for one reason or another just like up at West Milton we started the *Seawolf* prototype and operated it and something went wrong and we had to shut it down 30 or 40 days and we made changes in some apparatus there and got going again.

Mr. PHILLIPS. You would certainly agree, though, that if we were to put little five thousand kilowatt plants in operation—I may have been wrong but I gather now you are not recommending five thousand kilowatt plants to the exclusion of 150 thousand?

Mr. THOMAS E. MURRAY. No.

Mr. PHILLIPS. I was wrong. You would agree that to put five thousand kilowatt plants into operation would not be an experiment that would put us ahead of all competing areas in the production of power through atomic energy?

Mr. THOMAS E. MURRAY. That is correct, sir.

FOREIGN COUNTRIES

Mr. PHILLIPS. There is another matter that gives me concern about the bill which I understand is coming out of the Senate committee. I have not been able to get a copy of the report so we are a little handi-

capped to know just what the situation is, but about this building of power plants abroad—I do not know whether you were here, Mr. Murray, but I address my remarks to you because you have said in this hearing you thought we should build power plants in other countries.

I do not know whether you were here the other day when I used a personal illustration that I am engaged with a group of people in building a piece of equipment we think will make a very marked change in the operations of the dairy industry. Our desire is to keep it near us because when we put this into a plant for the first time we know we have to have it under observation constantly and we do not want to put our engineers and experts on planes and fly them to California or Minnesota or Wisconsin every two or three days nor do we want to pay for their living and traveling expenses to keep them there a month or so. I do not see why that simple illustration is not what we are up against here.

Why do we propose to take power plants which, in this entire testimony, have been classified as experimental, and put those in England or in Jordan or India or Belgium, or somewhere else, where every time a bug develops in one of them, which you, yourself, just said developed in the *Nautilus* and might develop in the others, we have to get the experts we can borrow from utilities and industries, and rush them abroad.

Mr. THOMAS E. MURRAY. I would agree that it would be a mistake to put experimental power plants abroad, experimental power plants that we did not have enough experience in this country to know they were going to work.

Mr. PHILLIPS. I thought according to the testimony, we had built only pressurized water reactors. In other words, this proposal to build power reactors abroad refers only to those which we have proven to be successful in this country.

Mr. THOMAS E. MURRAY. I would go along with that and I would like to add that in 1954, for example, I recommended that we put a hundred thousand kilowatt reactor in Japan. That is over two years ago. The question was asked at the time, what kinds of reactor would you put there? I said I would put an advanced PWR reactor there. I would believe the power that was produced from the PWR of an advanced type in Japan would compete with the power costs in Japan.

Mr. PHILLIPS. You mean to say that two years ago, Mr. Murray, in your opinion, we had reached a point sufficiently advanced to permit us to put a 100,000 kilowatt unit in Japan?

Mr. THOMAS E. MURRAY. Yes, sir; of the pressurized water type.

Mr. PHILLIPS. I have been listening to this justification for ten years. I do not want to go back and review what was on the record two years ago.

Mr. THOMAS E. MURRAY. This was just a suggestion in order to get on with the foreign reactor program. I could not agree with you more, Mr. Phillips. You would not take, for instance, the breeder reactor where we are running into a lot of trouble and will run into a lot of trouble in getting it into operation, and decide to put it into some foreign nation. That would be a mistake. You would be running scientists and engineers back and forth to try to service this trouble and that trouble.

When you develop your small power plants to the point in this country where you can safely say that we believe they are ready for the foreign market, they should be put abroad.

I will give you an illustration. The Belgian Government today is putting in a fifteen thousand kilowatt PWR pressurized water reactor along the general idea of the *Nautilus*. They did not take any new design or anything. They wanted to produce power and they wanted to be sure they could produce it.

Mr. PHILLIPS. If I may come back again, I have to translate these things into something I understand. If I can come back again to this little milk device that I keep using as an illustration, we have been five years on that. It has been working wonderfully in laboratories, in a little pilot plant, but we have yet to get it out, and processing 10,000 pounds of milk.

I would like to ask you and other members of the Commission whether we have reached a point in the perfection of atomic energy reactors and equipment where we are prepared to say that we can now use them as a finished product; in other words, put it on the production line and on the open market and therefore be ready to build these generously all over the world with our money to supply the other nations with the things for which I think they would probably increasingly dislike us. Everything we do for them seems to me to produce additional dislike for us.

I am about to ask the other members of the Commission whether they agree with this testimony regarding the perfection of our reactors and placing them abroad.

Now, Mr. Murray.

Mr. THOMAS E. MURRAY. I limited myself in all these remarks to the technology we now have, that is, to the pressurized water reactor and improved designs of the pressurized water reactor.

Mr. PHILLIPS. I think that is clear.

PRIVATE VERSUS PUBLIC POWER NOT THE ISSUE

Will you please tell me how you make your statement, that you wish to avoid a public and private power argument, conform with your desire, in previous testimony, to place one of these Federal power reactors in the State of Nebraska, and my distinguished Chairman here is critical of the fact we did not sell the Niagara Mohawk power to something less than one per cent of the power distributors in the State of New York.

Nebraska happens to be the only State in the Union that is completely public power; it pays no taxes on it, does nothing to support private power, but occasionally it does come down and asks us for a subsidy.

Mr. THOMAS E. MURRAY. In answer to a question of Mr. Jensen along that same line, I read a statement which I have made in connection with my general proposals.

I said that construction of a large-scale sodium graphite reactor in the near future presents a different problem. To solve it, I propose an approach which differs in detail but not in principle.

Concretely, I would have the Government assume the responsibility for building a large-scale reactor of this type.

It could be located in Nebraska, and the power made available to the Consumers Public Power District of Nebraska.

Mr. PHILLIPS. Then you did not recommend that it be put there?

Mr. THOMAS E. MURRAY. Not definitely. Let me give you my reasons in back of this. In this case, the Consumers Power Group, and I am not familiar with the politics or the public power situation in the State of Nebraska, came to us under the first round and they recommended that they build a sodium graphite reactor. It is one of the most important types that we have to explore.

Mr. PHILLIPS. Did they propose to pay for it?

Mr. THOMAS E. MURRAY. They wanted some assistance from us under the first round.

Mr. PHILLIPS. About 60 per cent, was it not?

Mr. THOMAS E. MURRAY. I am not sure of the figure, but they were going to put up something and we would put up, perhaps, the major portion of it.

However, they had made arrangements with the North American Aviation Company and that company has done as much or more work in the sodium graphite field than anybody else.

They made their proposal on the basis of the experiment that North American is carrying out at Santa Susana which may be finished next year. If that were successful, and if the economics of that plan proved as good as the estimates submitted to them by North American, they would then be in a position to go ahead with the sodium graphite job.

Mr. PHILLIPS. We subsidized them?

Mr. THOMAS E. MURRAY. That is right, just as we are subsidizing many others. We are subsidizing some of the private power groups, too.

But it was only in that context, Mr. Phillips. That is because they had been in this business with Consumers for about a year and a half. It had been their baby and had been their field. Their proposal was the only one for a sodium graphite reactor of any size and the Commission seized it. It was decided by the Commission that we should go ahead.

I made the distinction there, not that it necessarily would have to be placed there, but that it was one way to approach this over-all subject and would enable us to get on with this sodium graphite problem.

Mr. PHILLIPS. I do not want to engage in a controversy with you because I do not think one exists, but I am not sure that your answer explains the statement you made; your statement about not wanting to get into the public vs. private power issue.

Mr. THOMAS E. MURRAY. I had hoped that it would.

Mr. PHILLIPS. I think you can disregard all political implications. I think it is just a factual matter which should be as well known to you as to any member of your Commission, that here is a public power state failing to pay taxes, occasionaly asking for a subsidy, and on the other hand, there are places not engaged in controversy—

Mr. THOMAS E. MURRAY. But you must recognize that the Commission approved that project, and approved subsidizing that project in the State of Nebraska under the same conditions you are talking about. We have already taken action on that.

Mr. PHILLIPS. I had not heard any other member of the Commission say he was extremely anxious to keep out of the public vs. private power controversy.

Mr. THOMAS E. MURRAY. I am particularly anxious that this whole atomic energy business be kept out of the public vs. private power issue because it leads to great conflicts, it leads to delay, and it will not get us ahead with the job.

As I say, I came up with a proposal that these big plants be placed at our production sites.

Mr. PHILLIPS. Having worked in Congress for 14 years, I would question whether you keep out of controversy by starting a public power plant in the most controversial state in the United States on that subject.

Mr. THOMAS E. MURRAY. This action has been taken by the Commission. It has been approved.

I am not stating anything here that is new.

AUTHORIZING LEGISLATION NEEDED FOR ATOMIC ELECTRIC PLANTS

Mr. PHILLIPS. May I ask the other members of the Commission these questions? Have you been asked your opinion; have you testified on the Senate bill; have you approved of the Senate bill; do you approve of putting these reactors abroad at the present time; do you approve of the 2,000,000 kilowatt crash program which has been suggested before this committee?

Mr. Strauss, would you comment on that?

Mr. STRAUSS. We were called in to session by the Joint Committee with respect to a committee bill to replace the bill introduced by Senator Gore but we had not been asked, as of last night, our opinion on the revised, latest bill, the one which has been reported out, nor have we seen the committee report which is supposed to accompany it.

We have had no opportunity for a meeting of the Commission in the interval.

Mr. PHILLIPS. In that respect, Mr. Strauss, you and I are in the same boat. We have not seen the report here, and the latest bill, dated June 29, 1956, does not specify any number of reactors, which I find, here or abroad.

Are you aware, either by rumor or by statement, how many reactors are being discussed for building?

Mr. STRAUSS. No, sir. We have been informally advised that the report will be more specific with respect to numbers, and I personally was puzzled as to the finding of fact of a committee report as opposed to an Act of Congress on our future course of action.

Mr. PHILLIPS. I may say jokingly that depends a little bit on whether you want to follow it or not.

I was informed by one administrative agency head that because something was in a report, a subject our subcommittee put in, it had no force and effect, so we had to write it in the bill as it went through on the other side.

Mr. STRAUSS. I think, Mr. Phillips, the Commission will either be responsive to the wishes of Congress or, as individuals, they would not want to serve.

Mr. PHILLIPS. I was not referring to this Commission.

How these plants abroad, then, how they operate, do I understand that you agree or do not agree with that?

Mr. STRAUSS. I do not believe the bill in the form in which it finally emerged said anything of any specific nature.

Mr. PHILLIPS. We have a copy of S. 4146.

Mr. STRAUSS. Is that the number which was given to it?

Mr. PHILLIPS. That is the June 29 bill. I find nothing which says you have to have so many——

Mr. STRAUSS. That was my recollection, that it was very general in its language.

Mr. PHILLIPS. You see the distinction. S. 2725, which is the original one, said, "A bill authorizing and directing the construction by the AEC of six nuclear power facilities for production of electric energy." The new bill says, "A bill providing for civilian atomic power acceleration program," which is somewhat more broad.

Mr. STRAUSS. I have just been handed a bill reported out by Senator Gore.

Mr. PHILLIPS. What number is that?

Mr. STRAUSS. It is S. 4146.

Mr. PHILLIPS. We have that.

FOREIGN ATOMIC POWER SYSTEMS

Mr. STRAUSS. On foreign atomic power systems there is a brief paragraph reading:

> In order effectively to carry out the Atoms for Peace Plan of the United States, the Commission shall have responsibility for the conduct of a vigorous program of international cooperation, assistance in the design, construction, and operation of power reactors and related matters. The planning and execution of such a program shall be undertaken as rapidly as possible.

Mr. PHILLIPS. Then will you turn to page 2, beginning on line 7, and read lines 7 and 8, which seem to have a bearing on the matter.

Mr. STRAUSS. "To advance the spirit of the international Atomic Energy Agency and the Atoms for Peace Plan." That is under the amendment to Section 241, purpose and policy.

Mr. PHILLIPS. What is the International Atomic Energy Agency?

Mr. STRAUSS. That is a body which does not yet exist. The proposal to create it was made by the President in a speech which he delivered to the General Assembly of the United Nations on December 8, 1953.

A series of meetings beginning in March of this year were held here in Washington with representatives of some twelve nations in attendance, including the Russians, the British, the Belgians, the Portuguese, the Indians, the Czechs, the Australians, the South Africans, the Canadians, and ourselves. If I have omitted any it is inadvertent.

In April they succeeded in drawing up a draft statute for an international agency to which the 12 governments were prepared to subscribe.

This statute is to be submitted to delegates from some 75 countries who are to be convened in New York in late September.

Following that meeting, and upon the assumption that they will agree to the language of the statute, it would then go the governments of the various countries for ratification. My belief is, subject to correction by the staff, that ratification in the case of the United States, will require approval by the Senate.

Mr. PHILLIPS. On your statement I should say we were getting into an entirely new field when we begin to tell you to cooperate, or whatever the word is, with the purpose and policy of the Congress,

and presumably eventually to appropriate money for it, to advance the spirit of an organization which does not exist.

Coming back to the question we had in mind originally, may I ask the other members of the Commission, you Dr. Libby, whether you think we should put these reactors abroad at the present time?

Dr. LIBBY. I think we should get along with the reactor business as fast as possible.

Mr. PHILLIPS. What value would you foresee in planting reactors abroad with the present condition of the reactor program?

Dr. LIBBY. The only value I can see at the moment is an indirect value. I speak now narrowly of getting along with atomic power and not the broader problems of international relations.

Mr. PHILLIPS. That is what we are presumably appropriating money for.

Dr. LIBBY. There might be some incidental advantages. You might get some students in the foreign countries interested in going to work on atomic power who might discover some things which might, in turn, help us.

You see, the field is becoming pretty well unclassified these days. A good part of it now is, as shown by the large amount of information given at the Geneva Conference last summer.

Therefore, power reactors abroad might serve this incidental purpose, but I think research reactors would be better for this than atomic power reactors. The students would be able to experiment with them and do research work.

We have a vigorous program on research reactors now under way.

Mr. PHILLIPS. Here in this country?

Dr. LIBBY. Abroad. We have some 42 nations which have concluded bilateral agreements with us or are in process of so doing, and many of these nations either have already or plan soon to arrange for the purchase or erection of a research reactor.

Mr. PHILLIPS. What did we do with that hot reactor we took to Geneva?

Dr. LIBBY. We sold it to the Swiss. Whereas we made it to run as a low power reactor so that we could show it to people, they are raising the power and putting in apparatus for experiments. It will be operating in a few months at its new location as a real research reactor.

The reactor we set up at Geneva was all right, but it had no cooling. They are adding that as a part of their program.

I do not want to say that putting a small power reactor abroad would not help interest the people. I don't think it will help much on atomic power unless it does interest people. That is my firm belief.

I do not believe that just putting a reactor abroad which produces uneconomic power and operates for a length of time will help very much.

My interest is to get people into the game. In Europe, of course, there is a tremendous reservoir of technical manpower which might be tapped for atomic power. So the program might have that incidental advantage.

There may be other aims of the government which would be served by such a program, and I am not commenting on that at the moment.

Mr. PHILLIPS. Have they been revealed to your Commission?

Dr. LIBBY. We learn about them. The whole program for the International Agency, the President's Atoms for Peace Program, has been put forward by the President as an item of international policy. We do what we can and work hard to implement the program through the bilateral agreements I mentioned, the distribution of isotopes, and so on.

However, I am not sure that supplying a foreign country with a power reactor which is uneconomic is necessarily a help to them unless it interests people to work on atomic power.

I think research reactors or small power reactors would be the thing.

I am worried about giving them a reactor so hot to handle that it would be difficult to use for experimental purposes.

From my narrow point of view, it would be better to have a small amount of money and fissionable material involved in this program and have this put in to smaller units.

I do not know whether or not I have answered your question.

If Congress sets out its program, we will do our very best job to carry it out and make it serve the purpose of getting along with atomic power. We will do everything we can on that score.

The success we will have in doing that will depend entirely on how freely they let us move.

It is difficult, you see, with limited manpower to plan these things ahead for a long time in a precise manner, and I hope whatever the Congress does, it will leave us freedom to move and to spend this money for this program in the wisest way, bearing in mind that our purpose is to get along with economic atomic power. That is our aim.

Mr. PHILLIPS. Mr. Vance, I have asked other members on this question. Have you anything to add to this?

Mr. VANCE. I would like to make the same distinction as between research reactors on the one hand, and power reactors on the other.

I think our present program, which is far along, for the encouragement of the building and operation of the research reactors abroad, has real merit.

As a matter of fact, in fiscal '57, there is an item in the appropriation for Mutual Security Assistance (I. C. A.) for that purpose.

Insofar as power reactors abroad are concerned, I think we should encourage them to the extent of furnishing information, as we are currently doing. What we are really discussing here today is the matter of financial assistance.

I do not believe that our efforts to go along as fast as we can in the field of research and development of power reactors would be aided sufficiently by the use of American funds to build power reactors abroad to justify the expenditure.

I think that money for that purpose can be much better spent at home.

URGENT NEED TO BUILD ATOMIC ELECTRIC POWER PLANTS

Mr. PHILLIPS. You lead directly to my next question, which I also intended to ask each member of the Commission here present. It has to do with this matter of additional money.

There seems to be a feeling prevalent in some quarters and in some groups in the United States, that the way to solve all problems is to just appropriate more money by the Congress.

If we have a depression, we must just appropriate money.

If we have people who are sick, we just appropriate money.

We are now asked to appropriate more money, at least I gather the staff has recommended that to the majority side of the table, to appropriate more money than recommended by the Budget.

Can we acquire, do we have the technical know-how, do we have the scientists, is it possible to go ahead with a 2,000,000 kilowatt crash program?

In other words, how much will we advance ourselves by sticking additional money into the Budget? Perhaps I should include in that, if you care to say anything, the production of scientists, whether that actually would help us create scientists, a matter in which I am personally very much interested.

I will start with you this time, Mr. Vance. Have you any comment on whether, by just appropriating more money, we will be able to create reactors and scientists out of thin air or whether this would spread us rather thin in the field of atomic energy advance?

Mr. VANCE. I testified before the Joint Committee recently that I thought the principal difference between Mr. Murray and myself on this matter is a question of timing. We are today engaged in active research on a great variety of reactors, not yet having gone far enough on the technological road to know which of these reactors are going to emerge as being the best for the production of economic power.

I think the time will come when one or more of these reactors will so emerge and that is the time when we want to go into a program of large reactors, and we would want to do it fast.

If it cannot be done fast, by private capital, then the Government should step in and support the effort.

However, I do not think we have reached that point as yet.

Mr. PHILLIPS. Dr. Libby, did you want to say anything about that?

Dr. LIBBY. I think the amount of money that is being mentioned will undoubtedly increase the number of scientists and engineers working in the field. It certainly will do that.

What I am afraid of—and am very seriously worried about, is that it will divert the ones now employed and knowledgeable in the field to less productive efforts. The real solution of the technical problem will not be obvious to most people. It would be obvious in general only to technical men trained in the field. These men have to work on these real technical problems in order to insure that we stay ahead of the rest of the world.

What I am worried about is that they may be diverted into other activities such as the construction of several large plants of a less imaginative sort.

This is a matter of judgment, Mr. Phillips. As you see, Mr. Murray and I do not agree about this. I think I am right. I am sure he thinks he is right.

One thing you can be certain of: We will try our best, whatever you decide, to see that we get along with this as fast as possible. Certainly one of the primary aims is to maximize the rate at which new people are brought into this field and to do everything we can to improve scientific and engineering information and to get more people in the field. We will do everything we can to assure that.

At the moment, under the present conditions, we have done what we think is a fair job of this. We try to avoid the wasting of scientific manpower.

You see, what I am talking about is a conservation of a rare resource, namely technical talent. I am a little worried. I do not want to use this adjective, but this urgent program, this mandate program, may force us to take people off of the real job to do another job. Maybe it would result in the end in new people coming in who would solve the real problems—youngsters, you know. It is a question of judgment. I think it is a risk.

But insofar as I have anything to do with it as a member of the Commission, whatever the Congress decides we will try to administer it in such a way as to get along with the job of getting atomic power in the most rapid manner.

One of the items I think we will have to watch most carefully is this question of diverting valuable manpower from the real job to something else.

Mr. PHILLIPS. Admiral Strauss, could you answer the question—perhaps you or General Fields—when the amount originally requested was reduced by the Bureau of the Budget was there in the reduction any element of feeling that that money could not be profitably spent this year and therefore could be left out of the budget, rather than an arbitrary reduction in a budget just to balance the budget or something like that?

Mr. STRAUSS. I think it was the former reasoning, Mr. Phillips. I would be glad to come back to that at the end of my answer if you wish.

I would like to subscribe to what both Mr. Vance and Dr. Libby have said, with one additional observation. Several hundred pages back in the record which we have made there is a very interesting discussion about the shortage of technical people. I think it was Chairman Cannon who made the interesting suggestion that one of the ways to correct this was at the Boy Scout level—a very interesting observation, but it points up the fact that the building of plants today in a "crash" program to get these plants on the line between now and 1960, is not a period in which you are going to make large numbers of engineers and scientists in addition to those you now have.

We have at present a certain available reservoir of this talent. There is not the slightest doubt in the minds of any of us that if the people of the United States, expressing their will through the Congress, want a lot of atomic power plants built all over the country at the present state of the knowledge, we can do it. We can do it, as Dr. Libby said, at the expense of the development of new enterprises. We might come out at the end of such a period with a very substantial number of installed kilowatts in obsolescent and indeed obsolete plants and find that the competition we are so apprehensive about overseas, not necessarily alone in Russia but in other countries, had outstripped us technically.

Mr. PHILLIPS. From the point of view of competition with countries overseas, I find it difficult to reconcile the point of view that we should build a lot of reactors because they have announced they are going to do that, and be dilatory about building a nuclear propelled merchant ship which we have every reason to believe other countries are

engaged in and which from the point of view of world prestige would be a real blow if we were second or third in that area.

With respect to the first part of your question, the question with which you concluded your question, I would like to ask General Fields if in the conversations which we had with the Bureau of the Budget I have at all misrepresented the matter in stating that they believed that the figure to which they approved for us to come before your Committee was not a figure which they felt would suffice between now and the next session of Congress for the expenditures we would have to make in connection with this program.

Mr. FIELDS. I believe that is the position they took.

Mr. PHILLIPS. Mr. Murray, my intention was not to ask any other question than the one I have asked these people. I just ask you for your comment on it, because both Mr. Vance and Dr. Libby have indicated that they thought they had a disagreement with you. I felt, when these hearings started, that you were being labeled as the dissident, and that you had become more and more gregarious as the days went by and were coming back into the bosom of the Commission, little by little. If we could continue these hearings for another week you will be right in with the Commission again, as you used to be.

Mr. THOMAS E. MURRAY. Maybe I was always out of step with the various Commissioners for the last 6 years, on many issues. Whatever I said, I want to assure you I did it with the idea of doing what I thought was best.

I would just answer the question that you have been asking about this money that has been taken out of the budget. The staff recommended that it could spend this money. The staff recommended that it wanted the money, and the Bureau of the Budget cut it out.

Mr. PHILLIPS. Was there anything unusual about that? Is that not the same thing that happens every year in every agency?

Mr. THOMAS E. MURRAY. I do not want anything cut out so far as development of nuclear power is concerned. When the staff really came up at the time I said: "Well, you ought to add another $100 million to that."

Where did I get the $100 million? Just in order to go ahead. We have not enough money to finish this second round, if we decide to go ahead with these other problems. We do not have any money to go ahead with the third round of industrial projects in this budget. The third round should be announced, but the Commission has not progressed that far.

Mr. PHILLIPS. You have not gotten the first one off the ground yet, have you?

Mr. THOMAS E. MURRAY. I know, but you have to keep going. You have to get going, Mr. Phillips, and you have to bring people in.

INADEQUACY OF AEC ORGANIZATION TO DO THE JOB

Now, the next thing I would like to call your attention to is this: Money is all right, as I emphasized here this afternoon. You could appropriate the $400 million or the $500 million. But unless we take a complete new look at this whole problem of getting on with reactors and redeveloping our staff and reorganizing it, I do not think this money will mean anything particularly much to us.

Mr. PHILLIPS. You do not think it might mean something to the taxpayers?

Mr. THOMAS E. MURRAY. Well, it might mean something to the taxpayers, yes. I do not divorce this whole problem I am presenting here from the weapons problem which is facing this nation. I just cannot. I cannot divorce these two things, no matter what is said; whether you are only thinking in terms of reactors and whether you are going to put them abroad and how fast you are going to go ahead.

We have the power to destroy the world today through nuclear energy. Russia may have the same. What are we going to do about it and what are we doing about it? But as Mr. Taber said, let us not make speeches.

Finally, I want to call your attention to the fact that the Joint Committee did send out telegrams to some 42 different firms to see whether they would regard themselves as fully qualified to take the responsibility for atomic power reactor construction as prime contractors, and they got a lot of very good companies replying "Yes." You see, that is the way I believe you are going to get ahead with this business. You are going to spread this thing out. You are going to get more companies in and you are going to develop more technicians.

To say you have to sit back and just wait for the high school boys to come through and become nuclear physicists and so on, and to take these things in that kind of a so-called orderly step—that is an orderly step. If you have lots of time, everything is all right.

Mr. PHILLIPS. Strange as it may seem to some people who listened to this testimony for over a week, the primary function of this Committee is to decide the exact amount of money that is needed for a program, and whether we need, for example, $40 million or, shall we say, $32,000,251.16. We have not yet reached that in this hearing, but I hope we will eventually.

Mr. THOMAS E. MURRAY. I am relying on AEC staff figures.

Mr. PHILLIPS. The other thing I would like to say before you go is this: While I confess in this instance I do not agree with you, I think it is a wholesome sign that you do have a feeling you can be a dissident member of the Commission, because another agency of the Government comes up before us, which I occasionally discuss with my friend Mr. Evins, where the Commission seems to have some sort of a unit rule. If two members of the Commission believe one thing, then the third member seems to think he has to agree with the other two in coming before the Committee.

Thank you very much.

Chairman CANNON. Very good, Commissioner. You have rendered exceptional service to the nation.

Mr. STRAUSS. Mr. Chairman, I think I should say that the Commission generally does not share any distrust or disparagement of the staff. We feel that the staff of the Commission is very competent and devoted, and anything that may have been said here today that would lead any of you to the impression that we are dissatisfied with the staff in any way, is an impression I would like to dispel.

Mr. PHILLIPS. Mr. Strauss, we are fully acquainted with the staff, some of us for many years, and have a very high regard for them. I pointed out to the last witness that nothing unusual had happened. Every staff seeks all of the money it thinks it can possibly get. They go through Mr. McCarthy's office (Note: Mr. McCarthy is Budget

Officer for AEC.) and then to your Commission and then to the Bureau of the Budget and finally we get it down to something within a reasonable amount for the taxpayers to assume. That is why we have a Bureau of the Budget.

We have no criticism whatever of your staff so far as the minority side of the table is concerned.

PARTICIPATION BY INDUSTRY

Mr. Chairman, did you want to run any longer today? I am about to start to read about 15 minutes of material into the record.

Chairman CANNON. The gentleman may proceed.

Mr. PHILLIPS. There has been considerable question here from time to time as to the attitude of the utilities and so forth, as to what to do and what they ought to do, and what they are trying to do, and what we all think is probably the outstanding program to be done. I am turning now to testimony given before the Joint Committee on May 29, 1956, by Mr. Fairman, who, according to the record, is Mr. James F. Fairman, Vice President of Consolidated Edison Company of New York, Inc. I think we will recognize that he is a man of ability and integrity. His testimony, it seems to me, illustrates rather vividly that if there is any statement to the effect, or any statement which might be understood to have the meaning, that the private utilities are not going ahead in the development and construction of large scale atomic power plants, it is completely without foundation.

Now I am going to quote from pages 400 and 401 of the record, and this is Mr. Fairman speaking:

> I would like to tell you a little about our conception of what this opportunity and responsibility mean to us at Consolidated Edison because it may help you judge whether a new Government undertaking is needed as proposed by Senator Gore.
>
> We are not suffering from a power shortage in this country. We are not in immediate danger of running short of a supply of conventional fuels. Probably electricity produced from atomic energy will not be competitive with that produced from conventional energy sources for several years, although we are optimistic that it will be competitive much sooner than many people think.
>
> Why, then, are we planning to build a nuclear steam generating plant?
>
> First of all, because we think we owe a duty to our stockholders to keep abreast and, if possible, ahead of technological factors affecting our industry.
>
> Second, because as a business affected with the public interest we have a similar duty to our consumers. The time to prepare for tomorrow is today. Tomorrow atomic power will be a business proposition and not just a developmental one.
>
> These factors alone would certainly have been enough to persuade us to go ahead with our program.
>
> In addition to these factors, we appreciate the unique nature of the effort of which we are a part. Like other citizens, who follow the course of world events in the press and in periodicals, we know something of the difficulties involved in maintaining American influence in the undeveloped areas of the world. We are not unmindful of the fact that our program, and others similar to it, can play a significant part in helping this country maintain its position in those areas.
>
> I have mentioned all of these factors, Mr. Chairman, because I want to make it clear that our company is engaged in a serious and substantial program. We recognize that we have a definite moral obligation to proceed with our program, and we intend to do so unless technological problems arise of such a nature as to slow up any atomic power program, Government or private.
>
> In our opinion, we and our contractor, Babcock & Wilcox, are now proceeding as fast as sound application of a new technology will permit.

Then Mr. Fairman, who is an engineer and a very successful administrator, who headed up the Defense Electric Power Program

in 1951 and 1952, which Administration administered the program of increasing the margin of power for defense purposes, goes ahead and sets forth clearly in his testimony—the testimony from which I am reading—why he feels the enactment of the Gore bill would not have the desired effect; in fact, he indicates it would have quite the opposite effect. Therefore, I want to continue to read from page 402, carried over to page 403:

You will certainly want to know—

said Mr. Fairman—

whether private industry is holding back. If we in industry convince you that we are not holding back, you will wish to note at that point that every type of reactor which the Commission considered worthy of extensive Government research in its original 5-year program is now authorized or proposed as a construction project.

You will then have to decide whether any useful purpose will be served by the reactor construction contemplated by the Gore bill.

If the purpose is to incorporate new reactor concepts, you will undoubtedly inquire whether the construction of additional power reactors will meet that objective, or whether it would not be preferable instead to expand the Commission's research program.

If tax dollars are to be used most effectively to further our national interests, you may conclude that substantial amounts can be better used on atomic energy for ship propulsion, for example, than on stationary powerplants.

If, on the other hand, the purpose of Government reactor construction is to duplicate the reactor types to be constructed by private industry, I feel certain you will wish to conduct a very searching inquiry into the need for this duplication. Will it, for example, accelerate or delay the projects already underway?

In our opinion, it will delay them because it will spread too thin a limited supply of manpower, materials, and effort.

A more fundamental question is whether a new Government program can in any event accelerate the pace of reactor development. In our opinion, it cannot.

The pace of development is governed not by numbers of men or dollars, but, rather, by the simple fact that the steps in perfecting this new technology must be taken in a certain sequence and with a certain time lag if the results are to be successful.

In listing these questions, Mr. Chairman, I have tried to avoid any basic philosophical overtones. Obviously, as a person connected with private industry, I believe that the job of reactor construction should be carried out by industry and that the Government should step in only if industry does not carry through.

Then I shall skip over to the bottom of page 404, where Mr. Fairman says:

Senator——

and I presume that is Senator Gore—

Senator, I have given that some thought as a citizen.

Senator Gore had asked him, Mr. Chairman, if he were speaking as a citizen. That is the answer.

Senator, I have given that some thought as a citizen. It seems to me that in our race with Russia, which takes place on many fronts, we may not be adopting the best methods. I get the impression, too frequently, that they think of something first and then we try to catch up with them, which to me seems to be terrible psychology on the part of the world we are trying to influence.

I believe that we can win this race on quality rather than quantity, for instance, and from what I know, I believe we are well on our way to doing it. I think the Russians are trying to propagandize the world simply by sheer quantity, numbers, men. They have more of this and more of that.

We can't compete in numbers. We have to compete in quality, which suggests to me that instead of trying to build quickly X million kilowatts of reactors, we should use our dollars in fundamental research in the development of pilot reactors

of promising types, and as soon as they are ready to be developed in larger sizes, go ahead and do it.

Of course, we studied this intensively over a year ago. We made our decision to pick this particular type of reactor. To a degree, our hands are tied. We are in a metropolitan area or close to it. We had to be sure that what we went in for was safe. That is why we chose a proven technique.

Our one contribution, we think, to the advancement of the art is the use of thorium, which at the time there was considerable interest in, but so far as we could know, little work had been done. We studied a great many other types of reactors. We picked this one because we thought we could make a modest contribution in this field by advancing the knowledge of the use of thorium, which we have hopes, incidentally, to make this thing economic in our area before we are through with it, not the first year, maybe not the fifth year, but we believe this particular construction we have can compete successfully with conventional fuels.

Then I shall skip over to a somewhat briefer statement on pages 408 and 409:

My concern when I read this bill—

that is the Senate bill—

which sets a mandatory number of six and presumably large reactors is based upon my experience here in Washington in 1951 and 1952 when I tried to get material and facilities for the power systems of this country both public and private in competition with all the other claimant agencies during that period of emergency, among whom was the Atomic Energy Commission, and the Atomic Energy Commission was the most formidable opponent that the rest of us had.

They got everything they wanted, and I won't say that wasn't right, but it upset schedules of manufacture, it upset deliveries, it just generally raised the dickens.

I can see, assuming that 6 reactors are approved by Congress, 6 large reactors with all the enthusiasm of your committee and Congress behind it, the Commission is going to start to do something, and I can very well visualize that even with the present capacity, manufacturing capacity, manpower, scientific brains, that something is going to slip and I just have a hunch that it is my reactor and the other private reactors that are going to take second place in that break, and I don't believe the net result of it is going to be that you are going to have more reactors and more kilowatts, and more successful demonstration of practicability than we would have if we let this thing go the way it is.

Now, if the Commission has a type of reactor that needs development and nobody has come forward to bid for it, no one could object, it seems to me, if the Government directs the Commission to build that reactor in whatever size is appropriate to demonstrate it, but I am certainly not aware that there are six new types that are worthy of immediate development, and I am not even sure there is one.

I read that into the record in full, Mr. Chairman, for a purpose; because this record, whether we realize it or not, will show for 7½ days we have in effect been casting aspersions on the ability or the intent or the willingness of industry in this country to support a program of such urgency and, second, that whether we realize it or not we have leaned to this program I spoke of a moment ago, that if something is not going very well in this country, we seem to say:

Let us disregard the number of scientists; let us disregard private industry; let us disregard everything else; we will just vote more money and the world will be saved with the atomic energy which is produced.

I doubt that, and I do not believe that is the attitude which this Committee should take.

COMMISSIONER MURRAY'S PROGRAM—COMMENT BY AEC

Now I have a few more questions, Mr. Chairman. Did you want to finish all of this up today?

Mr. Davis, I think I have asked this question before, but I have a note on it. Do you, as the Director of Reactor Development, yourself believe that this proposed "crash" program, as it is called—that is, construction by the Federal Government—would be apt to develop any more real know-how or operating experience than that which will be achieved through the Commission's present plan of research and development, or would it in your opinion be a waste of money and trained personnel probably at the expense of an advance in reactor technology which would otherwise be achieved under the Commission's plan?

Mr. DAVIS. Certainly it is my feeling that to enter into a large scale program of this sort would divert people not only from our civilian power development program but also probably from our military program as well. I do not think we would get farther ahead in a shorter period of time.

Mr. PHILLIPS. This question is somewhat along the same line. In view of the known coal reserves, what possible justification exists for a crash construction program by the Federal Government of large scale nuclear fuel plants which are obviously going to be non-economical, when non-Federal utilities are planning on going ahead on large scale nuclear powerplants partially or wholly at their own expense?

Mr. DAVIS. I do not know of any.

Mr. PHILLIPS. The Chairman at one point in this hearing made this statement regarding, as I recall, the Shippingport reactor, in which he said that the Federal Government got nothing from it. The quotation as I have it is, "from which the United States gets absolutely nothing." General Fields, do you agree with that?

Chairman CANNON. Which Chairman is the gentleman quoting?

Mr. PHILLIPS. You, sir.

Chairman CANNON. I do not recall that quotation in that context.

Mr. PHILLIPS. The quotation was, "from which the United States gets absolutely nothing."

Chairman CANNON. I do not recall making the statement.

Mr. PHILLIPS. I thought it was in reference to the building of these large reactor plants such as the Shippingport plant.

Chairman CANNON. I advocated earnestly the earliest possible completion of the Shippingport reactor.

Mr. PHILLIPS. Then I withdraw the question.

Chairman CANNON. I do not know of any way you could spend money more advantageously at this time.

GENERAL QUESTIONS

Mr. PHILLIPS. In some testimony by Mr. Murray, who has now left, I think in his testimony before the Joint Committee, he stated that the various types of nuclear reactors had been "staked out" by individual companies or groups. Is it not true that the proposals made so far do not preclude the construction or development by other companies of this same type of reactor?

Mr. STRAUSS. Your understanding is correct. There is no monopoly or exclusiveness to any individual or cooperative or corporation or company at all. As a matter of fact, I think in the course of testimony several days ago I mentioned the companies which were

engaged in development on several types. I am sorry I do not have that note with me, but there are a number of companies. The expression of Commissioner Murray to which you refer I think appears in a prepared statement which he presented. I forget whether it was at the beginning of these hearings or in his testimony before the Joint Committee.

EINSTEIN CONCEPT

Mr. PHILLIPS. I would like to get myself a little scientific knowledge free, if I may. You referred to Dr. Fermi and Dr. Hahn. What was Dr. Einstein's exact relation to this whole picture?

Mr. STRAUSS. I think your question arises from some opening testimony of Dr. Libby, and with your permission I will turn your question over to him.

Dr. LIBBY. Dr. Einstein discovered the consequences of the fact that the velocity of light is finite, and from that he deduced that energy and mass have an interchangeability, and from that he deduced that there were enormous stores of energy locked in the atom. This was in the early '20s and it was widely accepted. It was 18 years later that the key for unlocking this was found by Dr. Hahn and his co-workers in Germany in discovering the fission reaction, and by Dr. Fermi in discovering the chain reaction.

Mr. PHILLIPS. You mean if we had had no Dr. Einstein you would not have found the key?

Dr. LIBBY. I would not say that, but there has always been a mystery as to where the sunlight comes from. This enormous source of energy has mystified scientists for centuries, and Dr. Einstein showed how there could be an essentially unlimited source of energy in a star, and that led to the beginning of thinking of atomic energy.

Mr. PHILLIPS. Thank you. That is about all the scientific knowledge I can absorb in one afternoon.

(Discussion off the record.)

SCIENTISTS AND ENGINEERS—DEPLOYMENT

Mr. PHILLIPS. I have one more question. I will direct this question to Mr. Davis.

Will the Commission's present plan for a nuclear reactor make the best possible use of engineers, scientists, and trained personnel and give assurance of a break-through to greater discoveries; and, conversely, would this Commission's program for constructing large and small scale nuclear reactors require such numbers of engineers and scientists and trained personnel as to adversely affect the research on nuclear concepts now under way? I think Dr. Libby has answered that in part, but I would like to ask that question of you.

Mr. DAVIS. In all of our programs, both the civilian and large military program, we are attempting to make the best use of scientists and engineers and facilities available and we will have to increase those steadily. It is my opinion that if we divert any large proportion of these people to jobs of construction, that this will interfere with these development programs.

Mr. PHILLIPS. I will yield the floor to Mr. Taber or Mr. Jensen. I think that is all the questions I have, Mr. Chairman.

Chairman CANNON. Mr. Jensen.

PRIORITY OF THE MILITARY PROGRAM

Mr. JENSEN. In listening to testimony the past several days regarding the development of electric energy by the Atomic Commission, I am constantly thinking, just why are we making such a great issue of this civilian program? We know that you are not overblessed with scientists in number, and is it not a fact that the military program is much more important to the future security of America than the civilian program that we have been talking about these many days?

Mr. STRAUSS. Mr. Jensen, the law establishes the priority. The law sets forth in the opening declaration that the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the public welfare, subject at all times, and I repeat, subject at all times to the paramount objective of making the maximum contribution to the common defense and security of the country. The Commission has always operated with that as its precept.

Mr. JENSEN. I appreciate that, and I would not want to be one of those Americans, whether I am a Congressman or not, that would drive or attempt to drive the Atomic Energy Commission away from that main objective of developing and going forward with the development of atomic energy for the military. I would not want that on my conscience, especially since we have a sufficient amount of electric energy production in the United States today to take care of all the needs of anyone, whether it be for industry or what not; we have a sufficient amount to take care of their electric energy needs at the present time. There might be a few people living in far-away places from the main generating plants that do not have electric energy at this time, but 98 percent of the farms of America now have electric power, and it is noteworthy that in almost every section of our country private utilities and cooperatives and municipal systems and the Federal Government have cooperated to meet all the electric power needs of the country.

ELECTRICITY—ITS DEVELOPMENT

Mr. Krug, who later was Secretary of the Interior, said during the war that electric power was never too little or too late. We are indeed fortunate to be able to say that almost with no exception every electric power need is being met, and at a cost that has steadily declined over the years while other costs have been rising.

Throughout this current series of hearings it has been openly stated or inferred that if private utilities are allowed to construct large scale atomic power plants, that this will somehow form a monopoly of nuclear reactor know-how that would be detrimental to the public interest.

Looking at the development of electric power from 1882 with the first central station plant of 900 kilowatts to the present capacity in the United States in excess of 100 million kilowatts, it can be seen that such a theory of monopolization does not hold water. The first central station plant, the Pearl Street plant in New York City, used 10 pounds of coal per kilowatt hour, while today a kilowatt hour is

produced with around three-quarters of a pound of coal. Is that a fact?

Mr. STRAUSS. I believe it to be a fact, but I cannot say definitely.

Mr. JENSEN. That is the record. And the rate for electric energy has been for many years constantly decreasing. Now we have sufficient electric energy to carry on our normal business in industry and in the homes, so I cannot see, for the life of me, why we have to enter into a crash program and spend a lot of time and a lot of money in advance of real need in developing and building these huge atomic energy plants for civilian use. I think the Commission is going forward in a very sensible manner.

If we had to put emphasis on electric energy for military use today, if there were some place where we needed more electricity to build atomic bombs, then I would say, "Yes, let is build these reactors." But you have sufficient power to build your atomic bombs, do you not?

Mr. STRAUSS. We have no power shortage.

Mr. JENSEN. You have no power shortage. What I do not understand is why we are making such a to-do about rushing into the building of great huge electric atomic power plants for civilian use.

Mr. PHILLIPS. Will you yield for a question?

Mr. JENSEN. Yes, but let me finish my thought. I must say that I am a little worried about building these reactors around the world. We have had quite a little experience in the last ten years since World War II in that one of our friends during the war is now on the other side of the fence. I would caution the Commission to pick out very carefully the places where your atomic energy reactors are being worked on and developed. I am sure you are doing that.

FOREIGN COUNTRIES

Mr. STRAUSS. I can give you this reassurance. We cannot do anything in a foreign country without having negotiated an agreement with that country pursuant to permissive language in the Atomic Energy Act. When those agreements are completely negotiated, they are submitted to the President, who has to make a finding they are in the interest of the common defense and security of the country.

Mr. JENSEN. Of what country, our country?

Mr. STRAUSS. Our country. Then they have to go to the Congress and lay before the Congress 30 days before they become effective. This is to safeguard against any act by the Commission that might be taken, for example, while Congress was out of session.

Mr. JENSEN. All right. In closing I will simply say this. I hope there is no force on earth that will cause the Atomic Energy Commission to neglect their first obligation, and that is in the development of atomic energy for military purposes.

Mr. PHILLIPS. Will you yield?

Mr. JENSEN. That is all.

ELECTRIC ENERGY COST TRENDS

Mr. PHILLIPS. You said that the amount of coal required to produce a kilowatt hour had dropped from 10 pounds to three-quarters of a pound. My recollection is that in the same period the cost of power per kilowatt hour fell from 25 cents to 2½ cents, which is a tremendous drop. In other words, the consumer has had a drop of 50 percent

in the buying power of the dollar while actually the cost of power has become a cheap ingredient.

Mr. JENSEN. That is right. It has dropped from 25 cents per kilowatt hour in 1882 to a little over 2½ cents per kilowatt hour. Since 1939 the purchasing power of the housekeeper's dollar has declined nearly 50 percent for all items, yet the dollar buys nearly 50 percent more electric energy than it did in 1939.

EXPENDITURES BY PRIVATE INDUSTRY

Mr. PHILLIPS. Mr. Chairman, I have one question I neglected to ask which I would like very much to ask. Can any witness here today give me a figure for the amount of money which has already been spent in the development of this atomic energy program by private industry, by private utilities, and by these people who make equipment for them? How much have they committed themselves or contemplate spending, and how much have they actually spent? I think it will run into several hundred million—I will let you give the amount of money. I gather from this same hearing from which I have read excerpts, and which I commend to your attention, on page 356 Mr. Charles H. Weaver, the Vice President of Westinghouse, was on the stand and he testified that his company had already committed in excess of $20 million to reactor development, and here is the vice president of one of America's largest industry recommending against this crash program that would spread out the country's resources too thinly.

Rather than read it, may I have unanimous consent to insert in the record at this point, beginning at page 356, the five last paragraphs beginning with "Seven full-scale atomic power plants are now headed toward construction and operation between 1957 and 1962" and continuing to the bottom of the page.

I think that gives the attitude of one of the largest industries that has committed $20 million.

Will somebody give an educated guess as to the amount of money that American industry as a whole either has or expects to put in this program?

Mr. STRAUSS. Mr. Davis will try to answer your question in two parts, the amount of money we have reason to believe has been spent and the amount that is presently committed.

Chairman CANNON. Without objection the matter to which the gentleman from California referred will be included.

(The matter referred to is as follows:)

Seven full-scale atomic powerplants are now specifically headed toward construction and operation between 1957 and 1962. After operating experience with these, we are going to know a lot more about the competitive outlook for atomic power.

Consider the next 5 to 10 years as a shakedown period. During that period build and operate those plants which will contribute to our technology and from that experience map our future program.

My concern, as you know, is that we face squarely the fact that nuclear powerplants are still far from being "off the shelf" items. These plants and the equipment which comprise them are in an initial development period.

Our current military and commercial atomic power programs already impose a heavy drain on our resources of qualified technical manpower and industrial know-how. We must avoid spreading ourselves so thin that advancement of the art is sacrificed to an expediency which is not consistent with the true needs of our country.

It is my belief that the electric utility companies, working closely with power-equipment manufacturers and the Atomic Energy Commission, will act as a very effective and realistic governor on our industrial atomic power program. Given the maximum encouragement of Government, including a legislative solution to the third, party liability problem, I am confident that responsible members of the industry will not permit the United States to move into any secondary position in the development of commercial nuclear power technology.

AEC INFORMATION NOT DEPENDABLE

Chairman CANNON. I might say, however, that the schedule which has been submitted to us on the first day of the session gives these dates, and on investigation we found the dates were not dependable.

Mr. PHILLIPS. What were not dependable?

Chairman CANNON. The dates.

Mr. PHILLIPS. The dates? I have nothing referring to dates, Mr. Chairman.

Chairman CANNON. This says, "Seven full-scale atomic powerplants are now specifically headed toward construction and operation between 1957 and 1962." Our examination of the representatives of the Commission in these hearings shows that these dates are not dependable.

Mr. PHILLIPS. Let the record show there is a difference of opinion.

Chairman CANNON. It is not a matter of opinion. They say the dates are not accurate.

Mr. PHILLIPS. In a sense, it is a matter of opinion.

Chairman CANNON. If the gentleman will read the testimony.

Mr. PHILLIPS. I will be glad to. I would like an answer to my question.

Mr. DAVIS. I do not have any figures with me, but I would guess we can count up actual expenditures made by private industry to date of the order of $25 million or $30 million.

Mr. PHILLIPS. That is actually spent?

Mr. DAVIS. Money that has been spent.

I tried the other day to estimate the rate at which money is being spent, and came up with something on the order of $30 million a year.

Mr. PHILLIPS. For how long a period ahead?

Mr. DAVIS. This is the current rate for this kind of thing, and we know of plans by industry for reactors and for facilities which amount to several hundreds of millions of dollars. Part of this money is not yet committed and in other cases they have committed large sums. I do not know how this would break down.

Mr. PHILLIPS. I think we could say without hesitation that a very substantial amount of money has been, and is being committed by American industry to support a program from which they at the moment will gain no profit, but which will be helpful to the security and best interests of the United States.

Mr. DAVIS. That is right.

Mr. PHILLIPS. I have no more questions, Mr. Chairman.

Chairman CANNON. Mr. Taber, do you have any further questions?

Mr. TABER. I have no further questions.

Chairman CANNON. Mr. Murray.

PRESIDENT EISENHOWER'S VIEWS RATIFY THE APPROACH OF THE JOINT COMMITTEE

Mr. JAMES C. MURRAY. In view of the statements that were made I would like to make a statement on my own behalf, as far as my own interpretation of the record is concerned, and that is this:

It seems to me that the public utilities have a responsibility, both legal and moral, to their investor consumers and to the public to proceed in this field, but they must proceed cautiously and prudently. I commend them for the efforts they have made towards this end.

It seems to me that the government also has a responsibility in this field both domestically and in connection with its foreign policy.

In connection with the latter objective, I would like to read into the record a report of a panel appointed by the President which is contained on page 311 of the Accelerating Civilian Reactor Program in the hearings before the Joint Committee on Atomic Energy on May 23d through May 29th, 1956, inclusive, and I quote:

Mr. PHILLIPS. Page 311?

Mr. JAMES C. MURRAY. Yes; page 311. I quote:

> The humanitarian applications of atomic energy can make significant contributions to the health and prosperity of peoples throughout the world.

Then there are some stars indicating an omission.

> Atomic power may be the most tangible symbol of America's will to peace through the peaceful atom. Our domestic needs cannot be our only motivation. Otherwise, we leave without effective rebuttal the argument that America is so rich, so prosperous, that a revolutionary new energy resource can emerge without any urgent need on our part to put it to man's use. This must seem a strange position indeed to peoples possessing neither conventional fuels nor technical capabilities to put the atom to work.
>
> If we fail to act to bring atomic power to the free world, other countries will do so ahead of us, or progress will proceed at a slower pace.
>
> Peaceful uses of atomic energy will inevitably be developed throughout the world. The United States must lead.

That is all I have, Mr. Chairman.

Mr. STRAUSS. This panel was not appointed by the President, just for the record. It was a very excellent panel appointed by the Joint Committee on Atomic Energy, under the Chairmanship of Mr. Robert McKinney.

Mr. JAMES C. MURRAY. That is correct, but I want to point out that the President adopts and ratifies the vital concept of the inestimable value of the citizen's approach.

Mr. STRAUSS. There is a very interesting sentence on the page just ahead of the one from which you read, at the bottom of the page, in which he says:

> If, as one newspaper editor—

he is an editor of a paper in Santa Fe—

> I am any judge of public opinion, the Nation is confident that this distinguished committee will not cause the building of a lot of atomic powerplants, just for us to look at, brag about, and subsidize.

Mr. JAMES C. MURRAY. I would like to accept the correction as qualified by my own observation, but I would like to say that the President proposed—the statement also demonstrates—that the President proposed the establishment of a non-partisan citizens commission to review our international policy and to recommend addi-

tional ways and means of meeting the Soviet threat and the committee appointed such panel in accordance with that proposal.

I would like to also ask you, Mr. Strauss, whether you agree with the statement I just read?

Mr. STRAUSS. Oh, yes; I agree with it, but the statement of the President which is referred to there was made a year after this panel was appointed. This panel was appointed in March or April of 1955 and made its report in January 1956. It was a very excellent panel and we collaborated closely with it.

The reference to the suggestion of the President was to one which was made in a speech which the President delivered some time this spring.

Mr. JAMES C. MURRAY. Well, actually, Mr. Strauss, I do not believe that the source or timing is important. We do know that President Eisenhower in that speech ratified the extreme importance of the McKinney Panel. I think the statement is very important.

Mr. STRAUSS. May I agree with you?

Mr. JAMES E. MURRAY. I was wondering if you agreed with the statement.

Mr. STRAUSS. Yes, sir. May I agree with you. My correction was something that I felt you would want to have, record-wise.

Mr. PHILLIPS. Mr. Murray, I think that same panel on page 315 also recommended that private enterprise should carry a substantial part of the burden of research and development, including the construction and operation of full-scale demonstration plants.

Mr. JAMES C. MURRAY. I certainly agree with that. I thought my original statement had indicated that agreement. I think also, Mr. Phillips, that the statement concerning investments of these companies would be more accurate if we also included the amount of money that the Federal Government has committed, and the amount that their proposals require them to commit.

Mr. PHILLIPS. Would you like them to put that in at the same place?

Mr. JAMES C. MURRAY. I think they ought to put that in also.

Mr. PHILLIPS. We would like to have you, gentlemen, put in where we ask for the amount of money which we estimate private industry has contributed, the amount of money that the government has put in. I think, maybe, it ought to be divided into the preliminary money spent and then go into the money we are now spending on what would be peacetime projects. I mean commercial electric plants.

Mr. STRAUSS. We would be glad to supply that information for the record.

Mr. PHILLIPS. That is, as opposed to building weapons.

Mr. STRAUSS. It becomes a little difficult. We can eliminate the weapons program, but it becomes a little difficult to eliminate the military power reactor program. However, we will do the best we can and supply it for the record.

(The information requested follows:)

Through FY 1955, $86.1 million of operating costs was directed toward research and development on civilian nuclear power. In FY 1956, $39.4 million of operating costs was applied to continued research effort, and an amount of $53.2 million has been requested in the FY 1957 budget. Prior to FY 1954, funds were used to carry out general research and development on power reactors in basic areas of civilian power interest and application. FY 1954 witnessed the application of research effort to five basic reactor concepts, as well as on general

reactor problems of importance to the civilian power program, including several new concepts.

The amounts set forth above include only the costs directly chargeable to research and development on civilian power reactors. This program, however, has benefited by research and development work on military power and production reactors and other programs. However, it is not possible to measure the dollar value of such benefits.

Accrued costs for construction under this program totaled $5.7 million through FY 1955. It is now estimated that additional costs of $16.0 million will be incurred in FY 1956 and $47.8 million in FY 1957. Through FY 1955 costs were incurred for reactors and other facilities which for the most part were related to the five-year program. The FY 1956 estimate provides for continuation of construction on the five-year program and for permanent facilities required for the civilian power program. In addition to such construction, the estimate for FY 1957 also includes costs for construction under the power demonstration program.

Mr. JAMES C. MURRAY. This panel also made this recommendation; that is, the McKinney Panel, which is contained in the Joint Hearings at page 329 that in the event that industry does not take on the full risks and burdens, the Commission should support a program to bring atomic power to a point where it can be used effectively and widely on a competitive basis even to the construction with public funds of one full-scale demonstration plant of each major reactor size and type.

Do you agree with that recommendation?

Mr. STRAUSS. Mr. Murray, we have on a number of occasions testified that when any one of these designs or concepts reach the stage where we thought it merited full scale construction and private industry or some cooperative group did not step up to provide for it under its own services, we would be prompt to approach the Congress and to approach this committee for funds to do it ourselves.

Mr. JAMES C. MURRAY. Then, I take it, your answer is "yes?"

Mr. STRAUSS. Well, I do not want to buy his language in toto.

Mr. JAMES C. MURRAY. Well, the question provides for a yes or no answer. You could explain your answer if you disagree with any of the conditions.

Mr. STRAUSS. It is a little better to have it in one's own words.

Mr. JAMES C. MURRAY. Those are all the questions I have, Mr. Chairman.

Chairman CANNON. Without objection, the committee stands adjourned.

Mr. STRAUSS. Thank you, Mr. Chairman.

A
B
D
F
G
L
M
M
M
P
R
S
S
T
U
V

LIST OF WITNESSES

	Page
Armstrong, Sinclair	197
Burrows, D. S	1
Davis, W. K	1, 225, 300
Dunning, E. R	241
Fields, K. E	1, 225, 300
Garrett, Ray	197
Libby, W. F	1, 225, 300
McCarthy, F. J., Jr	1
Meeker, T. G	197
Miller, J. A	1
Mitchell, William	1, 225, 300
Murray, T. E	1, 225, 300
Price, H. L	1
Rickover, Rear Adm. H. G	1, 217
Scheetz, F. H	241
Shaw, D. F	1
Strauss, L. L	1, 225, 300
Tammaro, A	1
Uriell, F. G	197
Vance, H. S	1, 225, 300
Van Meter, D. C	241

INDEX

A

Page

Acceleration of program 52, 68, 72, 90, 94, 95, 137, 174, 194, 288, 329, 335, 338, 368
  Inadequacy of present organization of AEC for 339, 364
Atomic Energy Commission:
  Accomplishments of 104
  Authority under existing legislation 63, 67, 236, 303, 321, 325, 358
  Unanimity of positions of Commissioners 50, 63, 333
Atomic Power Development Associates 169
Atom, splitting of, description of 149

B

Belgium, agreement for construction of reactor for 187, 194
Budget for 1957, additional funds needed for increasing reactor program 227, 229, 232, 337, 338, 361

C

Christian Science Monitor editorial 89
Civilian power reactor program (*see also* Public versus private development of atomic electric power) 3, 6
Competitive sources of supply, development of 157
Contracts let for reactors 96, 97
Conversion of plant using reactor type of operation to conventional power-generating plant 183
Cost of electric power from atomic energy 33, 93, 95, 159, 167

D

Dates hearings held:
  June 25, 1956 1–62
  June 26, 1956 62–118
  June 27, 1956 118–163
  June 28, 1956 163–217
  June 29, 1956 217–299
  July 3, 1956 300–377
Detroit Edison Co 172, 198, 199, 200, 238, 331
  Application for license 228, 331
Development program 3, 10, 183
Disaster possibility from nuclear reactors 25, 29, 166

E

Electric companies' advertising program 241
  Advertisement of June 13, 1956 242
    Cost of 245, 297
    Firms sponsoring 245
    Genesis of 249, 295
    Interpretation of 277, 289, 295
    Purpose of 245, 292
    Source of information 256
Electric power from atomic energy:
  Amount generated today 349
  Civilian control of 222
  Cost of 33, 93, 95, 159, 167
  Difficulties of obtaining 10
  Farmer's need for 221
  Importance of proceeding expeditiously 52, 68, 72, 90, 94, 95, 137, 174, 194, 288, 329, 335, 338, 368
  Military significance of 217
  Responsibility for development of 252
  Sale or distribution of energy for commercial use 67, 342, 350

Page
Equipment, development of competitive sources of supply of 157
Exchange of information 103

F

Foreign countries, programs of 59, 224, 355, 359, 360, 372

G

General Counsel of AEC, claim of privilege 305
Genesis of fission reaction 4
Government's experimental program 97
Great Britain, program of 59, 68, 85, 269

I

Independent industrial program 97, 112, 231
Insurance 27, 43, 52, 59, 62, 65, 66, 80

L

Legislation covering AEC, authorizing 63, 67, 236, 303, 321, 325, 358
Legislative Counsel of House of Representatives, letter of 316

M

Military program, priority of 371
Military significance of nuclear energy 217
Mineral resources of the United States 138, 142

N

Nautilus, performance of 7, 70, 137, 149
Navy, program of 141

P

Patents 119, 124, 133, 136
Philippine Islands, need for atomic electricity 212
Power demonstration program 97, 109, 115, 135, 167, 229, 323, 326
Power Reactor Development Co 170, 208
Progress made in development of power reactors 52, 68, 72, 90, 94, 95, 137, 174, 194, 288, 329
Ability to accelerate program 334
Public Utility Holding Company Act 198
Amendments to 197
Detroit Edison Co., request for exemption from provisions of 172, 198, 200
Public versus private development of atomic electric power 55, 60, 332, 354, 356
Authority and responsibility of Atomic Energy Commission 63, 67, 68, 78. 236, 303, 321, 325, 358
Civilian control of electric power 222
Incentives of private industry 106
Private construction of large powerplants 102
Private industry, contributions of 122, 366, 373, 376
Privately financed program, difficulties of 93
Public power groups and cooperatives, participation of 114
Rights of private industry and the general public to discoveries 113, 118, 119, 126, 136

R

Reactors:
Acceleration of program 52, 68, 72, 90, 94, 95, 137, 174, 194, 288, 329, 335, 338, 368
Funds needed to increase program in 1957 ..... 229, 232, 337, 338, 361
Agreements with foreign countries for construction of 187
Aqueous homogeneous reactor 39
Boiling water reactor 23, 28, 33
Canada, reactor in 21, 27
Completed by private companies 271
Coal-steam generation 15
Commonwealth Edison 46
Completed, under development, planned or applied for, breakdown by types 259

Reactors—Continued Page.
Completion of, indefiniteness of 235
Construction of 43, 51, 52, 53, 65, 71, 100, 126
Ability to accelerate program 334
Authority of AEC under existing legislation 303, 325
Additional legislation required 321, 358
Contracts let for 96, 97
Distribution of construction contracts 167
Foreign countries 224, 355, 360, 372
Need of additional funds for 227, 229, 232, 337, 338, 377
Contracts let for 96, 97
Conversion back to conventional power generating plant 183
Danger from operation of 25, 29, 166
Description of 11, 117
Fast breeder reactor 37, 164, 178, 182, 225, 235
Companies connected with construction of 171
Detroit Edison Co. proposals 172, 238, 331
Gas-cooled reactor 42, 180
Genesis of fission reaction 4
Holyoke, Mass 230, 231
Insulation or shielding of 160, 166
Liquid metal reactor 42
Location of 31, 60, 166
Merchant ship reactor 340
Monopoly in development of 369
Organic moderated reactor 42
Pressurized water reactor 7, 17, 93, 155, 179
Prototype plants, need for 108
Seawolf, sale of electric power from 342, 352
Sizes of 78, 165, 223, 353
Sodium graphite reactor 34, 179
Status of projects for 97, 326
Summary of present program 179, 183, 194
Types of 3, 14, 163
Research and development, need of additional funds for 227
Responsibility for atomic energy development 252
Rickover, Admiral, general statement of 138
Russia, program of 59, 69, 84, 85, 92, 225, 269, 349, 350

S

Sale of power generated from nuclear reactor 67, 342, 350
Scientists, shortage of 2
Seawolf reactor, sale of electric power from 342, 352
Securities and Exchange Commission 197
Rule revision, proposed 216
Shippingport project 7, 104, 143, 155
St. Louis Dispatch editorial 80, 283
Sylvania Electric Products Co. plant, New York, explosion at 300

T

Timing of program 52, 68, 72, 90, 94, 95, 137, 174, 194, 329

U

Uranium and fossil fuels, supply of 13

Y

Yankee Atomic Electric Co 101, 199

○